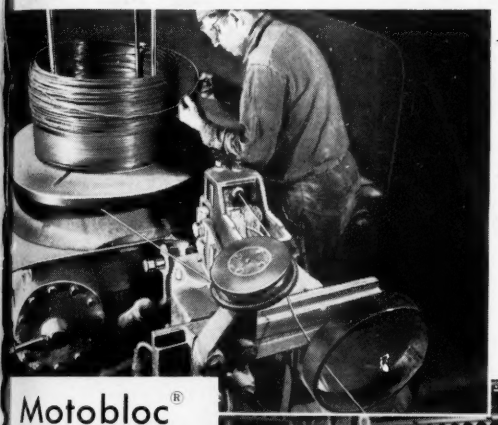
WIRE AND WIRE PRODUCTS

APRIL 1951

MEET TODAY'S WIRE PRODUCTION DEMANDS...

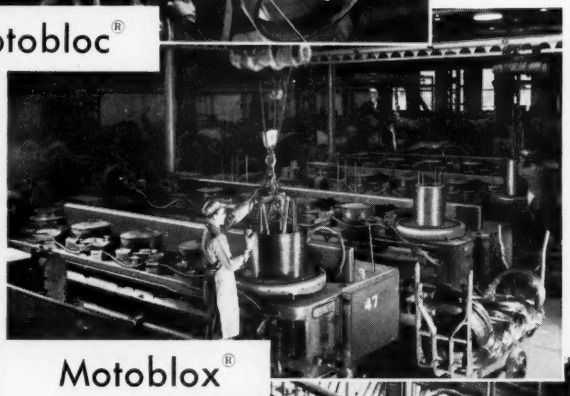


Motobloc®

....with Today's Fine Production Equipment!

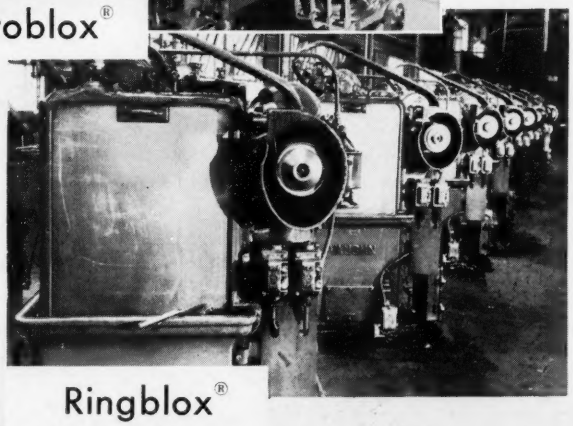
Vaughn®

WIRE DRAWING MACHINERY



Motoblox®

You *need* the finest equipment to handle high-volume wire production profitably and dependably—and you can't buy better than VAUGHN! Let us sit down with you on your current planning, and develop the productive facts you can use!



Ringblox®

The Vaughn Machinery Co.

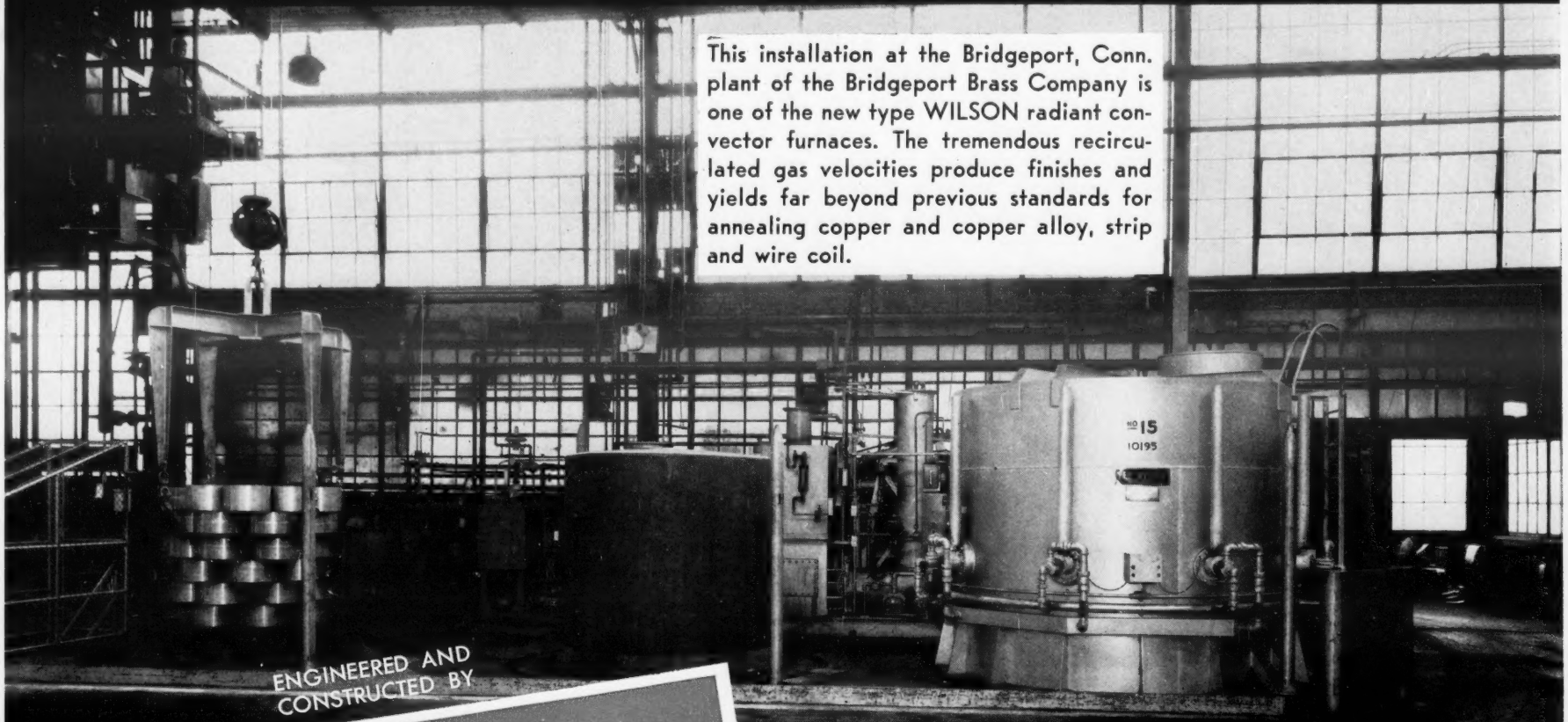
Cuyahoga Falls, Ohio, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

HIGH CONVECTION ANNEALING

at BRIDGEPORT BRASS COMPANY



This installation at the Bridgeport, Conn. plant of the Bridgeport Brass Company is one of the new type WILSON radiant convector furnaces. The tremendous recirculated gas velocities produce finishes and yields far beyond previous standards for annealing copper and copper alloy, strip and wire coil.

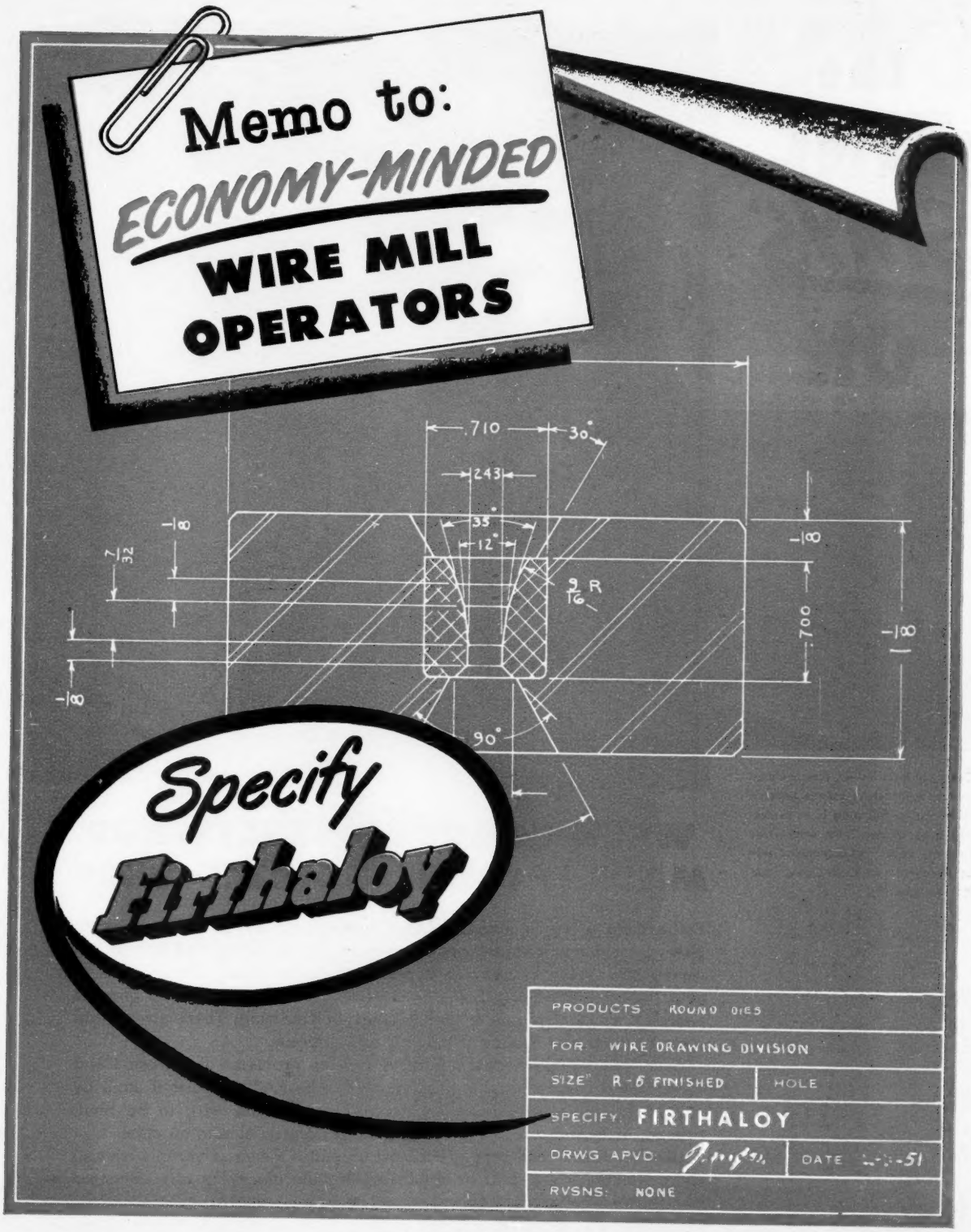
ENGINEERED AND CONSTRUCTED BY

Lee Wilson ENGINEERING Co., Inc.

20005 WEST LAKE ROAD • CLEVELAND, OHIO

Telephone ACademy 1-4670

INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING ★ HEAT TREATING PROCESSES



R-225

Firth Sterling
STEEL & CARBIDE CORPORATION

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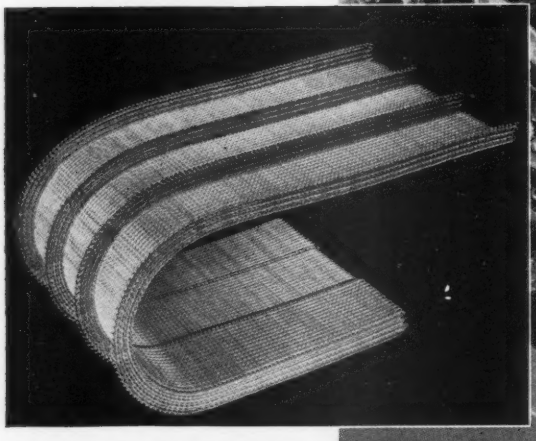
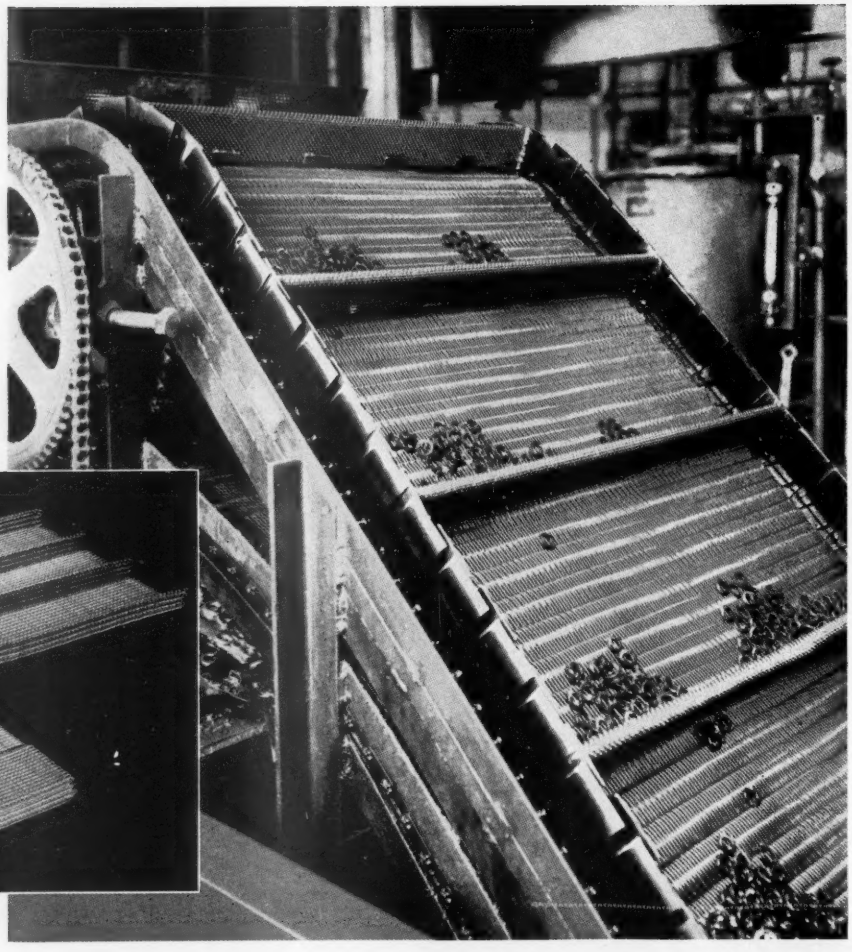
The ZINC STAYS ON





Conveyor belts woven from bethanized wire give long service because there are no thin spots in its protective jacket of zinc. These woven-wire belts are made from bethanized wire by Audubon Wire Cloth Corporation, Philadelphia.

WHEN CONVEYOR BELTS ARE MADE FROM BETHANIZED WIRE

Bethanizing makes a perfect bond between zinc and steel. There is no peeling or flaking of the coating during the weaving and forming of woven-wire conveyor belts—a drastic test for any kind of wire. And in actual service the heavy bethanized coating of 99-pct-pure zinc protects against corrosion far longer than ordinary galvanizing. There are no thin spots because the coating is smooth and uniform.

Users of bethanized wire rely on it to solve problems of corrosion and to withstand severe forming. The pure, ductile zinc—deposited atom by atom, by a unique electrolytic process—permits the wire to be bent, twisted, or drawn without disturbing the tight grip of zinc on steel.

Uses for bethanized wire are almost unlimited because various coating weights and tempers can be produced. It's the champion of zinc-coated steel wires—wherever appearance, corrosion-resistance, and severe forming are important factors.

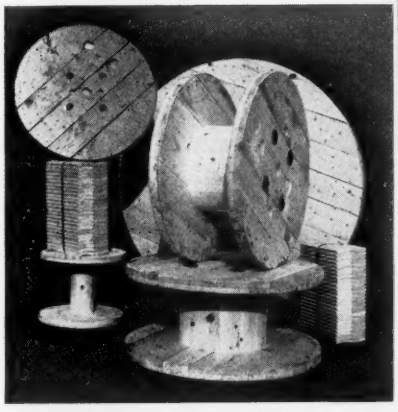
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

WIRE & WIRE PRODUCTS, Vol. 26, No. 4, April, 1951, Publication Office at Orange, Conn. Executive Office 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y. and Treas. Subscription price: U. S. $5.00; Canada $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, at the Post Office, Orange, Conn., under the act of March 3, 1879.

OVER NIGHT

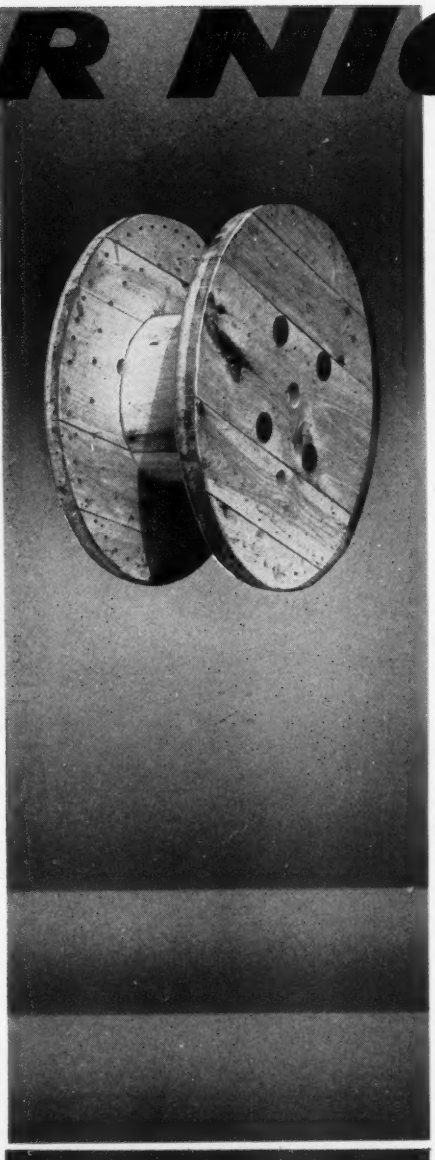


BRIDGE SHIPPING AND SHOP REELS

are furnished knocked down or assembled in sizes of 12" to 96" in diameter.

Standard types are carried in stock, but we can make reels to your specifications on short notice.

ALSO, REEL HEADS for STEEL DRUMS. Streamlined production methods give you the finest possible reels at the lowest cost.



BRIDGE REELS ARE DELIVERED BY TRUCK TO YOUR DOOR WITHIN A RADIUS OF 200 MILES.

And overnight, if you need them badly. For points beyond, fast N.Y.C.R.R. service will reach points as far away as St. Louis the morning of the 4th or 5th day. Even better deliveries to points like Buffalo and Cleveland. If shipped via the Pacemaker, they will be delivered to your door *at no extra cost.*

Look into BRIDGE'S unique distribution service and let us show you what we can do for you.

WOOD REELS
RETURNABLE AND NON-RETURNABLE

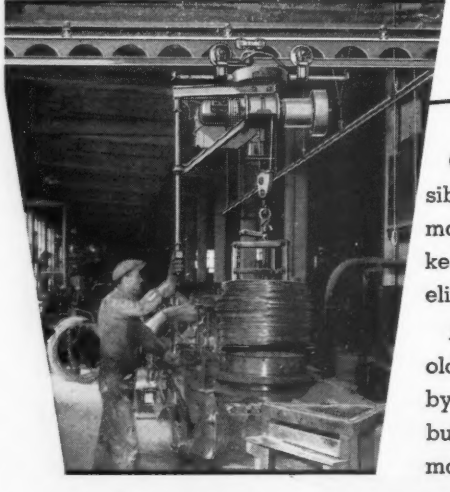
You are invited to visit our plant and see why our reels are well-made and low in cost.

BRIDGE
MANUFACTURING CO.
HAZARDVILLE, CONN.
Phone Thompsonville, 4928

Let us quote you on your reel needs. Send us your specifications. They will be given prompt attention.

BLOCK STRIPPING CRANES *and* CARRIERS SPEED PRODUCTION

FOR INTERNAL OR EXTERNAL BLOCK STRIPPING



Cleveland Tramrail block stripping cranes and carriers make possible the drawing of heavier bundles and permit a man to take care of more blocks. With this equipment older experienced men can usually keep pace with younger men. Hernia injuries from heavy lifting are eliminated.

Available for internal stripping and also for external stripping of old-style non-slotted blocks, the cranes and carriers are easily propelled by hand by means of a rigid arm. At the lower end of the arm is a push button for convenient operation of the electric hoist. If desired, the hoist may be mounted on a turntable to serve blocks on two sides of an aisle.

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OVERHEAD MATERIALS HANDLING EQUIPMENT

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with **Pittsburgh Steel Wire**

In all industry Pittsburgh Wire has proved again and again that it has the inherent quality to give top performance in any operation — forming, cold heading or spring making. The close metallurigcal control of every step in the manufacturing process from the blast furnace through the open hearth, rolling mills and wire mills gives you wire that is tailor-made for your particular practice. Since the ultimate quality of your finished products depends upon quality of the wire you use — be sure, specify Pittsburgh Wire. For information write Pittsburgh Steel Company, Department WP, Grant Building, Pittsburgh 30, Pa.

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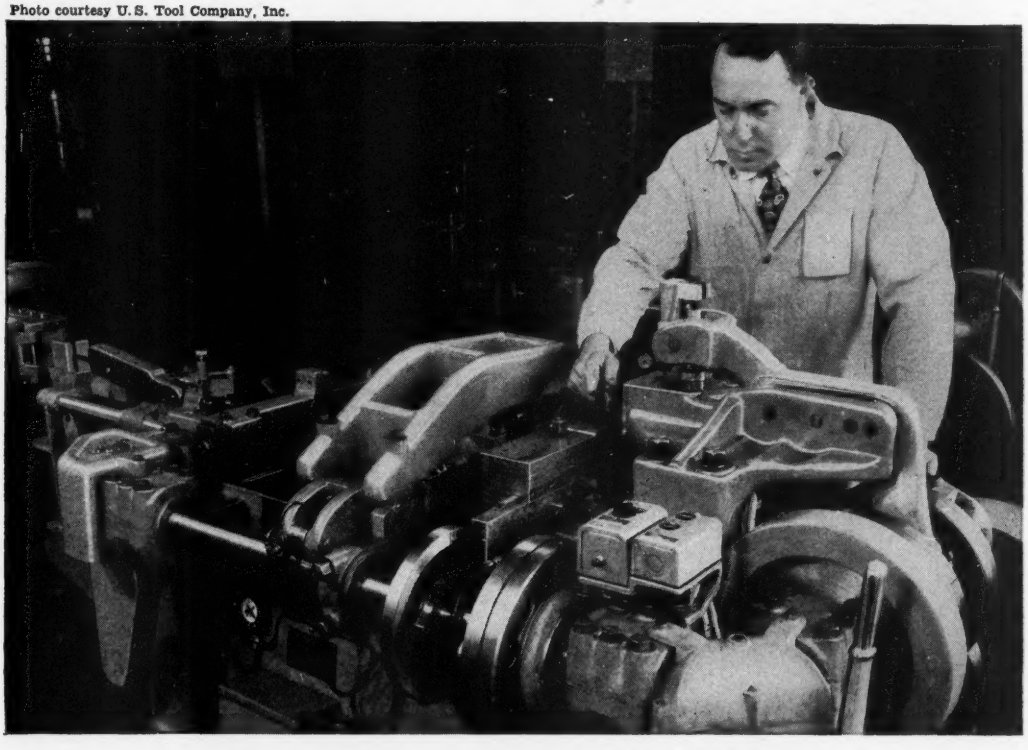
FLAT SPRING STEEL

Photo courtesy U. S. Tool Company, Inc.



You can always count on Roebling for absolutely uniform quality

FOR FLAPPER VALVES, shoe shanks, measuring tapes! For steel rules, curtain springs, snap springs, lock springs, drop wires, sinker steel and a thousand and one other exacting uses, you'll find that Roebling high carbon flat mechanical spring steel is unsurpassed.

Roebling's complete facilities for producing flat spring steel give us positive control over all phases of manufacture. The final product is dimensionally and metallurgically uniform... cuts down machine stoppages... minimizes rejects. And Roebling flat spring steel is made as you want it—annealed, hard rolled untempered; scaleless tempered; tempered and polished, blued or strawed.

Large quantities of Roebling specialty wires—flat, round and shaped—are required today in the national rearmament program. You can look to us, however, to do everything possible to meet your requirements. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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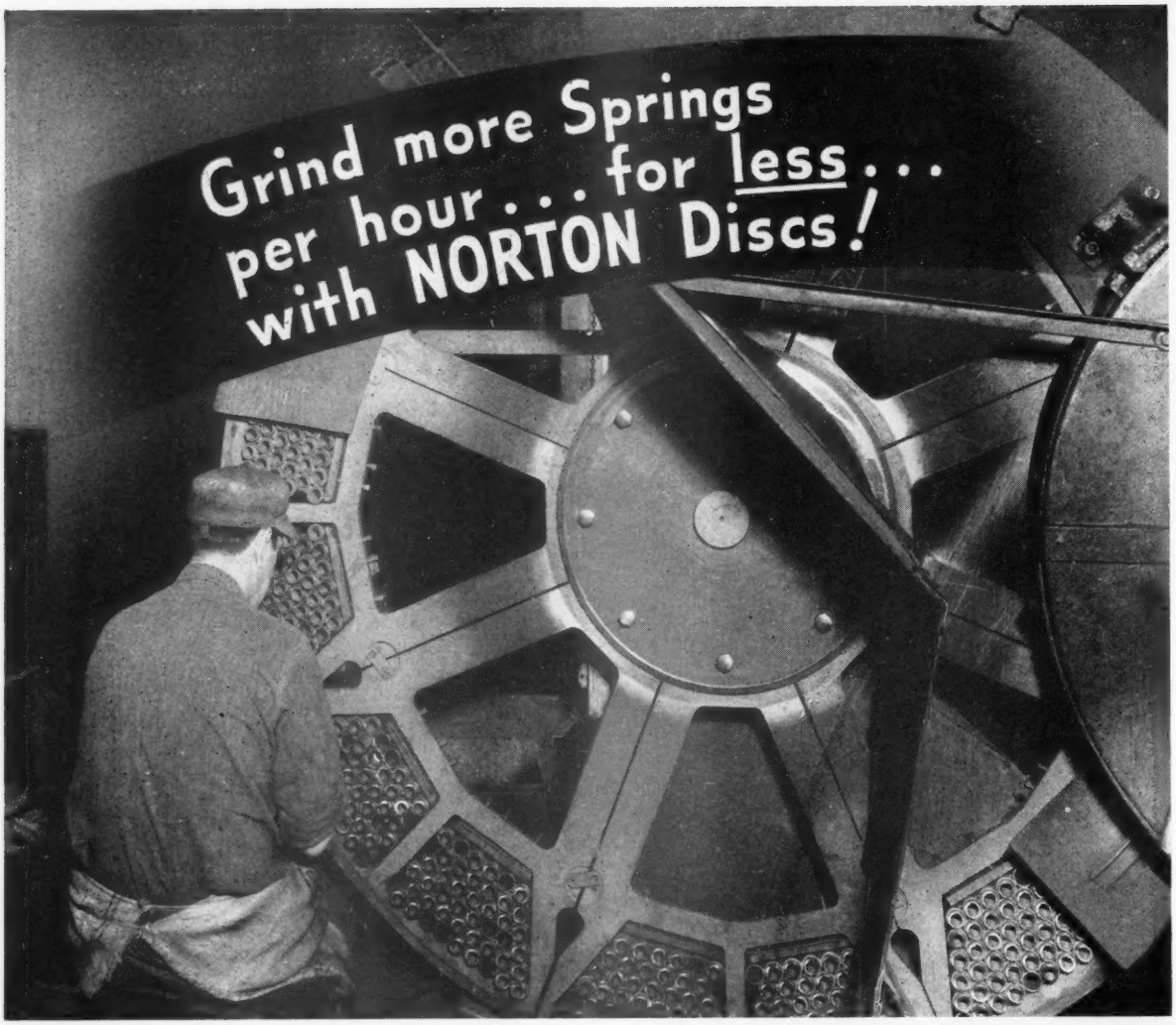

YOU can increase spring production and reduce spring grinding costs with Norton vitrified disc because they:

- **Cut Fast and Cool** — they contain vitrified bond and special ALUNDUM abrasives hard enough and sharp enough to easily penetrate the toughest alloy steels.
- **Have Extra Long Life** — the faster cutting action and more durable bond of Norton vitrified discs means less dressing is necesary — these discs last longer.
- **Have Uniform Grinding Action** — the same fast, cool, cutting action from each disc throughout its entire life — discs not affected by coolant, aging or storage conditions.

Norton vitrified discs are available in all standard sizes (15" to 72" in diameter) and with all types of mountings.

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Distributors In All Principal Cities

NORTON ABRASIVES

Making better products to make other products better

You'll Be Way Out In Front With HARTLEY

HARTLEY TUNGSTEN CARBIDE WIRE DIES

1. Save you money on first and secondary costs.

2. First, in the cost of dies to you. These savings are the result of Hartley ingenuity in the manufacture of dies. Die quality, however, is maintained at uniformly high standards. No cutting there!

3. Secondary savings come to you in the form of long die life, low wire drawing costs and dies that are fully guaranteed as to quality and workmanship.

4. In the manufacture of tungsten carbide dies your savings result from planned engineering. Exery order is engineered to your needs. Every die is made to a high degree of accuracy and finish. Besides which, you can count on *prompt service* on every order, whether for standard or specicl dies.

5. Send a trial order and you'll soon learn what HARTLEY service and fine dies can do to help you trim your own wire production expenses. That's all we ask—a fair trial in your mill will quickly demonstrate why "you'll be way out in front with HARTLEY".

Write us today about your requirements.

101 YEARS OF SERVICE TO THE WIRE INDUSTRY.

WATCH FOR THE HEART ON *Every* DIE

your assurance of highest quality and service

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is diamond lapped and imparts a bright, lustrous surface to parts drawn.
750,000 p.s.i. COMPRESSIVE STRENGTH
deep draws the toughest alloys with ease—without pickup, scoring or scratching.
95,000,000 p.s.i. MODULUS OF ELASTICITY
(3 times steel) holds size and tolerance to .0001"—cuts rejects and scrap.
SPECIAL MOUNTING PROCESS
is accurately calculated to withstand drawing pressures—and increases both the transverse and longitudinal strength of the nib.
79 ROCKWELL "C" HARDNESS
(hardest steel—68 "C") of talide nib assures continuous 24-hour production without downtime or maintenance costs.
up to 24" in diameter
ALLOY STEEL CASE
of maximum hardness, strength and toughness gives adequate support and backing to the carbide nib.

an easy way to *Triple Production* on a machine or press

• On the same presses and machines now in your production line, Talide Carbide Dies can make a big $ and ¢ difference. *Here's why.* Each Talide Die will outwear a steel die by at least 20 times and, in most applications, will last 50 times longer. Think of the cost advantages of those long runs and all the advantages of infrequent "down time" for redressing. Do as others do, *triple* your production with Talide Metal.

Made of the hardest metal known, each Talide Die has the same great strength, phenomenal resistance to wear and consistent uniformity. Talide Carbide never varies in quality.

Talide Carbide Dies are available for blanking, drawing, swaging, extruding, spinning or curling. For other operations, buy Talide bar stock, blades, cutting tools, drill jig bushings, work rolls or diamond products.

Try Talide Metal and triple your production with present equipment. Write us or nearest sales office.

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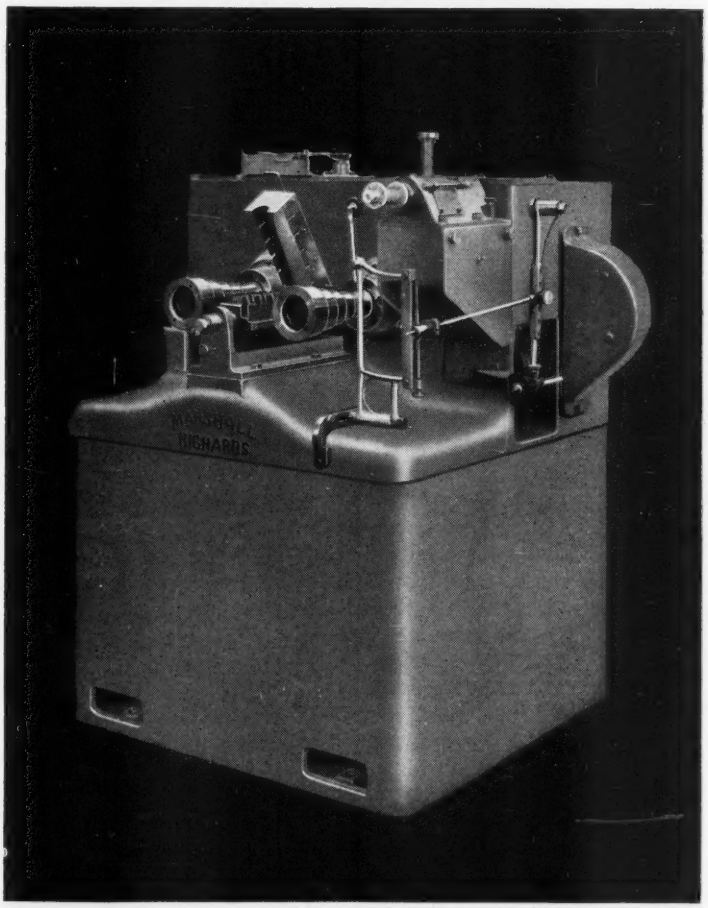
CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

TO DRAW WIRE TO .0004"...

MARSHALL RICHARDS SUPERFINE MACHINE



Spooling gear of the SUPERFINE is of the magnetic eddy current type which permits the tension on the wire to be adjusted and set within very fine limits before the machine commences to run. With tension set at a value below the breaking load it *cannot* increase while spool is being filled.

CONTINUOUS HIGH PRODUCTION of very fine wire! Without the usual breakages...without spooling difficulties! That's what you get with the Marshall Richards 10.F SUPERFINE Machine. Its precision spooler enables every spool to be filled to capacity at a constant tension, and it can be set with absolute accuracy before any wire is drawn.

The SUPERFINE is specially designed for drawing fine wire. Its two cones—dry drawing—*both draw wire*... the speed increase per step being arranged for a constant die elongation of 16 to 18 per cent. Wire is threaded on the Marshall Richards "figure 8" system... and the elimination of idle cones importantly decreases the slip between wire and cone faces.

Write today for full information about the Marshall Richards SUPERFINE or the complete line of Marshall Richards equipment for drawing wire in all metals and sizes up to 1 inch.

MARSHALL RICHARDS MACHINE COMPANY, INC.

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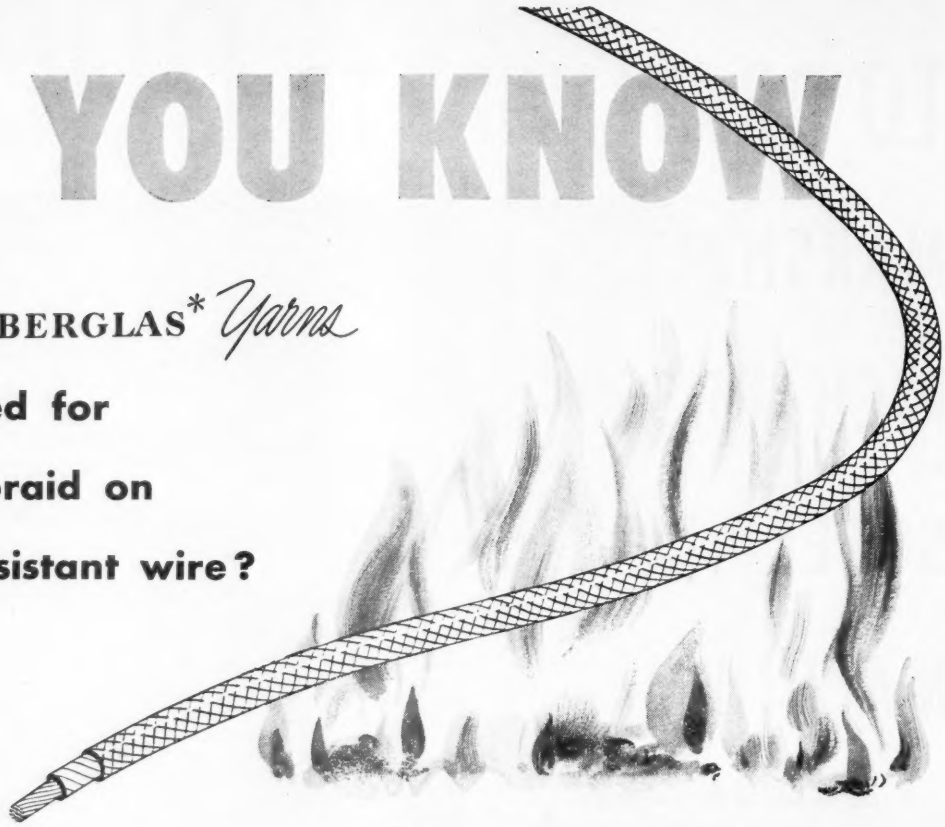
MARSHALL RICHARDS

D R A W O N O U R E X P E R I E N C E

DO YOU KNOW

why FIBERGLAS* *Yarns* are used for outer braid on heat-resistant wire?



Along with the entire electrical industry, Owens-Corning Fiberglas Corporation is faced with increasing civilian and military demands. While we cannot now supply all the materials our customers want, we are substantially increasing our production facilities. Therefore, we believe it to your future best interests to consider this new and recommended use of Fiberglas yarns.

FIBERGLAS *Yarns*

- ARE NOT AFFECTED BY HEAT
- WILL NOT ABSORB MOISTURE
- WILL NOT ROT
- RESIST CHEMICALS, ACIDS
- PROVIDE ADDED TENSILE STRENGTH WHERE NEEDED

*Fiberglas is the trademark (Reg. U.S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibrous glass.

For complete information about Fiberglas Yarn for this and other uses, write Owens-Corning Fiberglas Corporation, Dept. 875, 16 E. 56th Street, New York 22, N. Y.

OWENS-CORNING FIBERGLAS *Yarns*

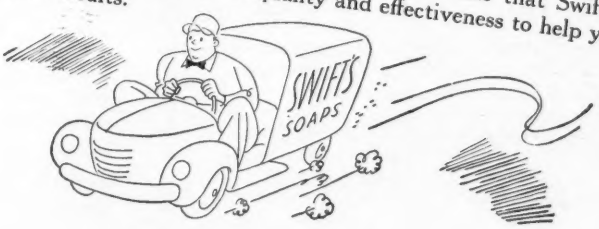
FIBERGLAS IS IN YOUR LIFE . . . FOR GOOD!

Rely on your

SWIFT'S SOAP TEAM!

We're READY with quality soaps for every wire drawing need! You can always find the right soap for the job in Swift's complete line. Whatever your specialized need, Swift's Soap Department can fill it. And you'll find that Swift's Soaps for wire drawing uses have efficient lubrication, minimum dusting and dependable uniform quality. You can't buy finer soaps anywhere.

WILLING to continue Swift's research laboratory activities to develop better products for your purpose! Our technical division is constantly working on wire drawing problems. This means that Swift Soap products always have the quality and effectiveness to help you get better results.



And ABLE to give service from Swift distribution points coast to coast! You can order any of the fine soaps listed below. Remember—use good soap and enough of it! Good soap promotes economy for you . . . better products for your customers. *Powdered White Ribbon • Guaranteed Powder • Snap Heavy Duty Wire Drawing Powder No. 282 • No. 559 Powdered Soap*

Plus other special formulations to meet your specifications.

See your local Telephone Directory for address of your nearest

Swift & Company

office.

Call SWIFT first for soaps

Come to Atlanta in May for the

SOUTHERN REGIONAL MEETING of the WIRE ASSOCIATION

Thursday and Friday, May 17-18, 1951, at the HENRY GRADY HOTEL, Atlanta, Ga. A fine series of technical papers and an interesting time has been arranged for you by the Program Committee, headed by Clem J. McGowan, Chairman.

THE PROGRAM

Thursday, May 17th

9:00 A.M.—Registration Desk Opens

10:30 A.M.—Directors' Meeting

12:30 A.M.—Directors' Luncheon; Wire Association Members Invited.

2:00 P.M.—Technical Session, William M. Dull, Supt. Wire Mills, Sheffield Steel Corp., Houston, Texas, Chairman of Meeting.

PAPER: "Wire Mill Practices at Republic Steel", by A. D. Gordon, Metallurgist, Gadsden, Ala., plant.

PAPER: "The Applications of Semi-Killed Steel in the Manufacture of Wire and Wire Products", by K. P. Campbell, Metallurgist, Sheffield Steel Co., Houston, Texas.

6-7 P.M.—Cocktails—Courtesy of Standard Industrial Compounds Co. and R. H. Miller Co. Ladies are invited.

7:00 P.M.—Banquet—Dixie Ball Room. Speaker: R. S. Lynch, President of Atlantic Steel Co., Atlanta. Ladies are invited to attend.

Friday, May 18th

10:30 A.M.—Technical Session; C. J. Beneke, Manager, Reynolds Metals Co., Louisville, Ky., Chairman of Meeting.
PAPER: "Safety at Atlantic Steel", by J. H. Girdler, Vice President in Charge of Operations, Atlantic Steel Co.

12:30 P.M.—Busses leave hotel for Atlantic Steel Company plant visit. Ladies invited.
Please wear walking shoes.

1:00 P.M.—Tour of Atlantic Steel Company plant.

4:00 P.M.—Barbecue as guests of Atlantic Steel Company at Glenn Field, recreation park of Atlantic Steel. Ladies are invited.

A registration fee of $6.00 will be charged for each person. This includes the banquet and transportation to the Atlantic Steel plant.

All wire men are invited to attend this Regional Meeting. Wire Association members may bring guests.

For those members who plan to bring their wives, the Committee particularly desires to stress the fact that plans are being made for their entertainment and that they will be welcomed at the banquet, the plant visit and the barbacue.

Hotel reservation cards are being mailed to members. Please return them as promptly as possible to be assured of accommodations. Those who do not receive cards are invited to write to the Association for them.

Be sure to attend this important session.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET **STAMFORD, CONN.**

More than America spent to win its Independence

THE Revolutionary War lasted 8 years and its direct cost was $74,555,642.

This sum is considerably less than the amount Youngstown is spending on expansion--its share of the steel industry's program to help preserve America's 175-year-old freedom from Communistic attack.

Work on a $90,000,000 construction project at the Indiana Harbor Works, East Chicago, Indiana, is under way. It includes a 1500-ton blast furnace, 75 new coke ovens and 8 - 250 ton open hearth furnaces, heating furnaces, a high-lift blooming mill, with 6 - 3 hole recuperative soaking pits, ore dock extension, unloaders and ore bridge, and a vast array of other facilities needed to produce the additional 1,000,000 ingot tons of steel involved. By the end of 1952, the steel industry expansion program will raise the total steel producing capacity of the United States to over 117-million ingot tons. This is more steel than is made in all the rest of the world combined.

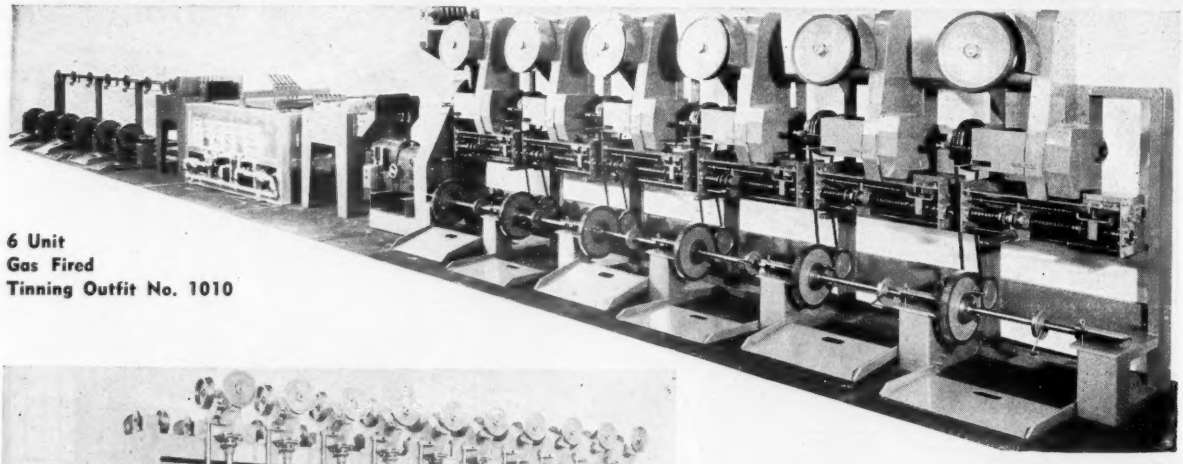
This tremendous investment by the shareholders of private industry is possible only with adequate profit--profit earned in the past and to be earned in the future. This is a symbol of public confidence--confidence that the American system of free enterprise is right *and worth saving.* Confidence that it will continue to be our way of life through the years ahead.

Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.



6 Unit
Gas Fired
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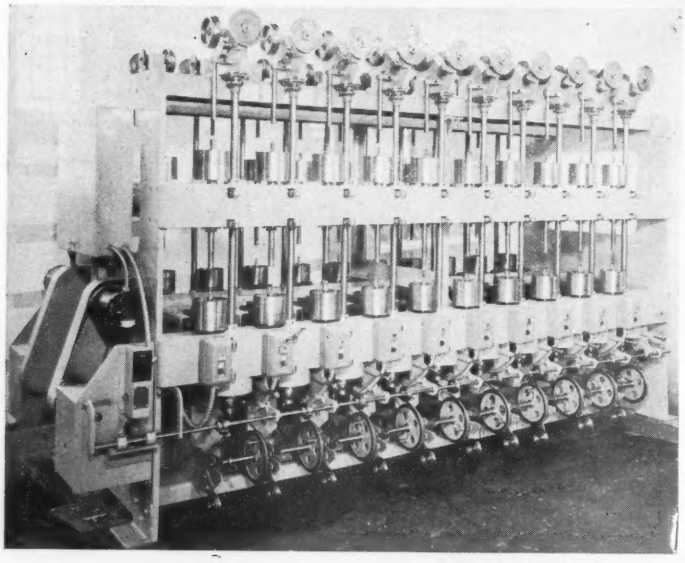

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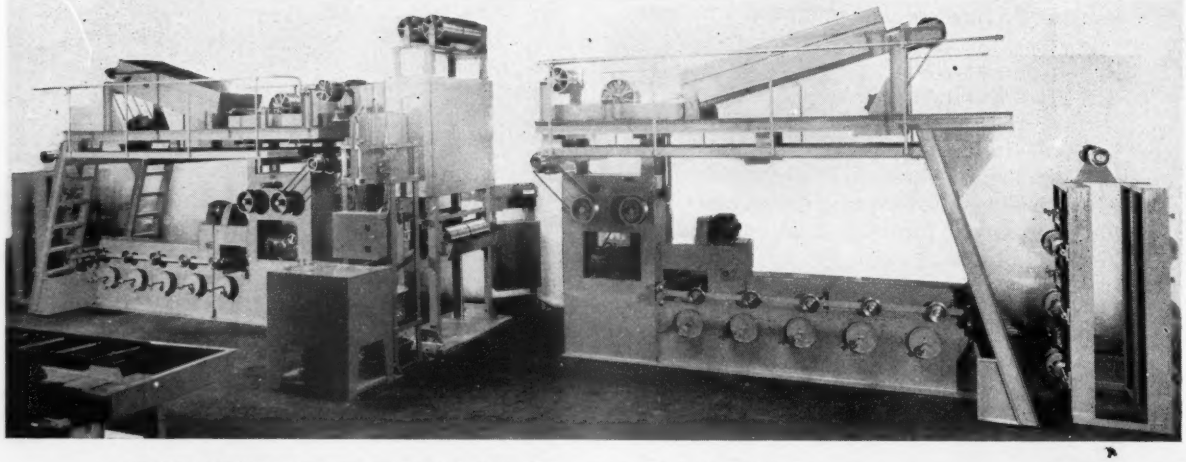

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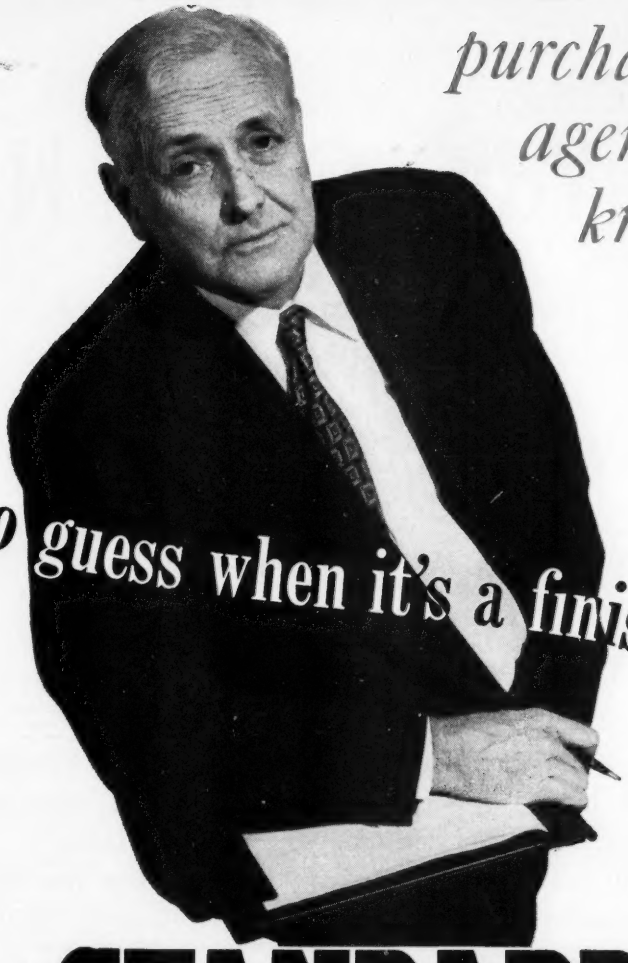

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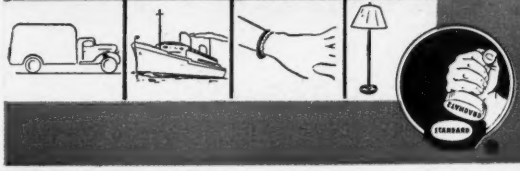

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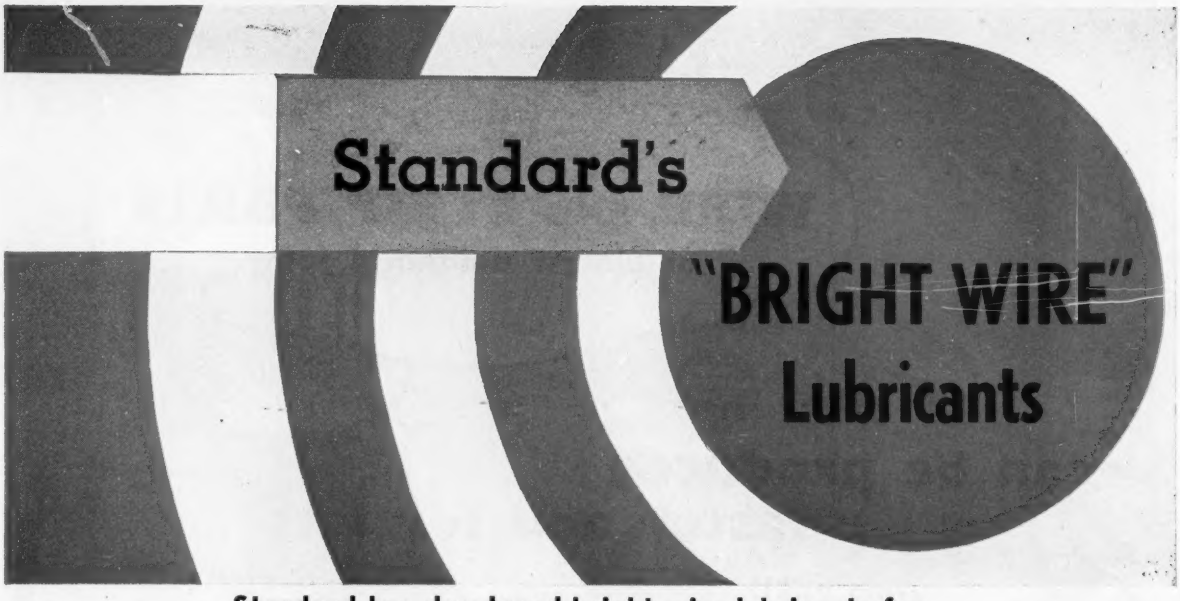

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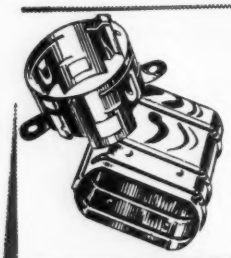

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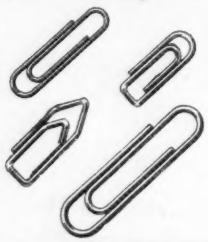

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The Wire Outlook

Some thoughtful observers believe that the worst of the recent inflationary spurt is over. Price mark-ups are fewer and smaller. Controls are beginning to work. Incomes and wages may be further adjusted, but more slowly under the controls. So far, taxes are extracting more from the public's purses than the Government is putting back in its spending. About 5 billions more will be collected this year, for the fiscal year ending June 30th, than for the preceding year. Runaway inflation, therefore, is likely to be avoided. The public is loaded with consumer goods and, with production high, the dollar should be entering upon a period of relative stability. The Government needs a strong industrial economy and is taking steps that will insure the maintenance of this strength.

However, it would add to the vitality of our economy were Federal spending confined to essentials. When the late New Deal instigator was elected, it was done on a promise to cut expenses by 25%. At that time Federal taxes amounted to $1.8 billions, state taxes to $1.9 billions, and local taxes to $4.5 billions. In 1950 taxes took these sums from our pocketbooks: Federal, $45 billions; state, $8 billions; and local, $7 billions. The totals for 1932 were $8.2 billions against $60 billions in 1950—up over 700%. For this year the President asks for $71 billions for Federal purposes alone.

In spite of the high cost of rearmament, it seems evident that no thought of saving elsewhere along the line has burdened the President's mental processes. The R.F.C. scandal apparently has not caused him to think about what may be going on in other bureaus. Should we be supporting 3 million or more bureaucrats who are swarming over, not alone this country, but a good part of the globe? Should the public be carrying 54 Federal corporations, whose competition not only makes it harder for private enterprise to serve its customers, but the taxes from which, if added to the Federal income, would lighten the burden on all? Prime charges to the present Congress should be to get the Government out of business and to pare all of its activities down to bare essentials.

Our Washington planners, because of the FTC ban on basing point selling of steel, may observe the practical iniquities of the ruling. The Government is paying various prices for steel, depending on the producing point. Our theoretical economists may not be impressed, but the fact remains that the policy is costing the Government more money and, hence, the taxpayers. Most steel producers are following the F.O.B. pricing system, with no freight absorption.

One ray of sunshine broke through the clouds in March when the Government stopped buying tin, creating panic among those whose gouging tactics were making too good a thing out of Uncle Sam. As our stockpiles of tin are adequate, this step to break the tin corner was very much in order. Another bit of good news is that copper stockpiling will be cut and the metal not stockpiled allocated to industry where needed.

Shortages of one kind or another plague electric wire and cable concerns, causing curtailment of output. If a supply of copper comes in, these mills may be lacking the rubber, yarns or other materials needed for operating. The flow of materials to these concerns is reported to be very spotty.

Rated orders for alloy wires are heavier, with civilian allocations correspondingly lower. Consumer pressure for wire items continues strong, with stringency in supplies becoming more acute. Nails and fencing are in great demand. The bolt and nut fabricators face a poor supply situation, with inventories on a hand to mouth basis. Upholstery springs are far short of users' needs. Spring producers are getting about 70% of the wire needed to maintain full production. Even wire rope, which has been in fairly easy supply, is becoming tight.

While orders on every wire manufacturer's books are at an all-time peak, it is quite probable that many of these are duplicated, as in and following the last war. This does not alter the fact that there are not enough wire, rods or wire products to meet the demand from customers. In another month or so, it is expected that more rated orders will be generally distributed, that the confusion of the present transition period will be somewhat lessened and that more mills will be getting the wherewithal to keep going profitably.

—from the Editor's Desk

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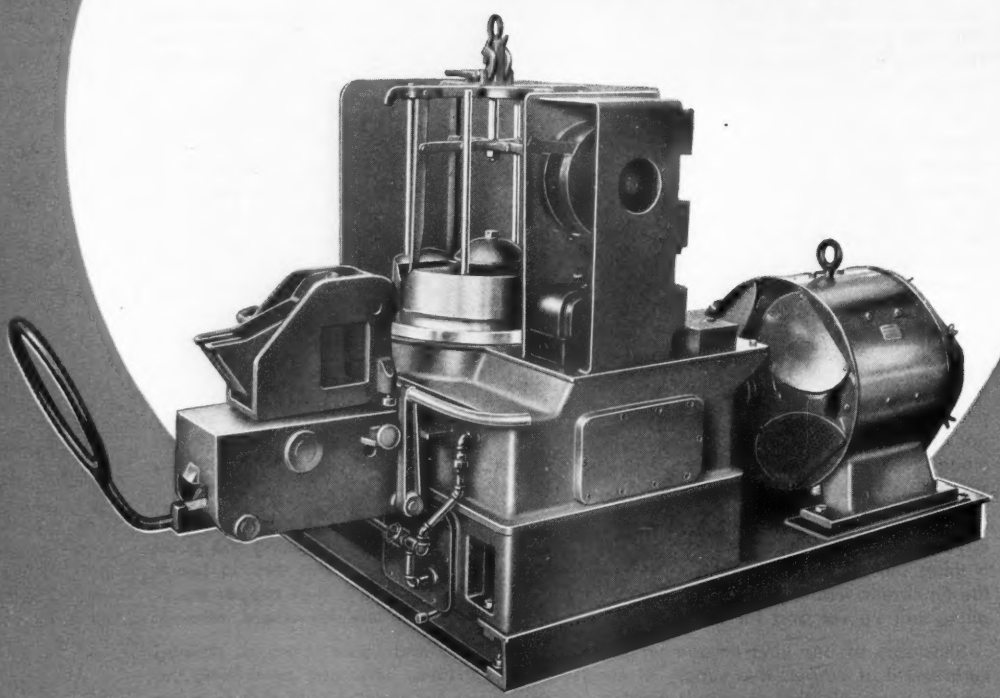

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Vol. 26 APRIL, 1951 No. 4

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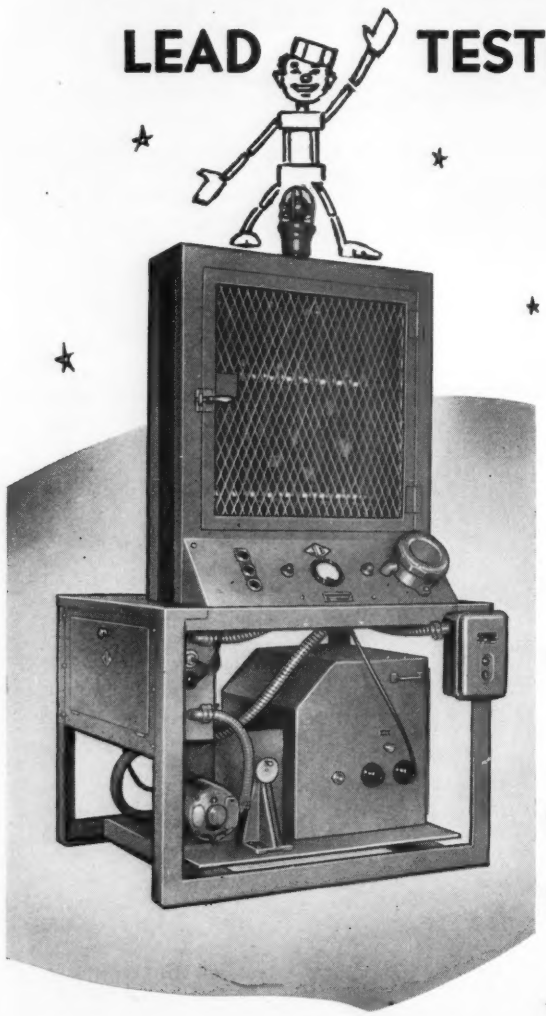

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Vol. 26 APRIL, 1951 No. 4

Wire Strain in Screen Weaving

by R. Traon, Research Engineer,
Ets. Gantois,
Saint-Dié, France

This article, the author explains, was inspired by other treatises that have been published in WIRE AND WIRE PRODUCTS on the subject of wire weaving. The author has conducted extensive tests on wire strains in weaving and in this article publishes some of his findings.

If one examines a wire screen made of square meshes and with the same weft and warp wires, it will be noticed that the waving of the warp is usually stronger than that of the weft.

★ ★ ★

Those differences in the waving are still more obvious when the meshes are rectangular, as the longitudinal wires form the longer sides of the rectangle.

★ ★ ★

It may occur that the waving of the weft proves to be practically impossible. In such a case, the screen is not firm, the mesh gauging is not sure, as the longitudinal wires can easily move.

★ ★ ★

The results vary according to:

- the sizes of the meshes, defined by:
  m : inter axis of 2 successive warp wires in mm.
  M: inter axis of 2 successive weft wires in mm.
- the diameters of the used wires, defined by:
  φ I : diameter of the warp wires in mm.
  ϕ 2 : diameter of the weft wires in mm.
- the nature of the used metals, defined by their resistance to strain, viz.:
  kc : average resistance to warp strain in kg/mm2.
  kt : resistance of the weft for the given strain in kg/mm2.
- the stress given on the loom to the longitudinal wires, namely T.
- the pass or angle formed by the lower and upper sheets of the longitudinal wires, say, 2β.

★ ★ ★

Such are, in our opinion, the factors determining the warp and weft waving.

★ ★ ★

Let us suppose:

- t : the weft waving, and we shall also define the angle between the warp waving and the plane of the screen.

We have now to try to determine the relations of such defined factors.

★ ★ ★

In the above paragraph we characterized the employed metals through their resistance to strain. It is important indeed to note that the weaving causes a **plastic strain** of the wires. A study of the strain stresses therefore appeals to plastic strain laws and particularly to the "flow curves" of the employed metals[1] which give the values of kc and kt for a given strain.

★ ★ ★

To state precisely what are the "flow curves", we must sum up one of the plastic strain principles: the conservation of the volume.

★ ★ ★

Say, a rectangle parallelepiped whose dimensions are h o l o b o – Suppose we strain its faces normally. We now get a new parallelepiped with dimensions hI lI bI. By reason of the conversation of the volume, we have:

$$h\ o\ l\ o\ b\ o = hI\ lI\ bI = V$$

or

$$\frac{hI}{ho} \cdot \frac{lI}{lo} ; \frac{bI}{bo} = I$$

or, taking the logarithms of equation I :

$$\frac{\log hI}{ho} + \frac{\log lI}{lo} + \frac{\log bI}{bo} = O$$

which may be written:

$$\phi h + \phi l + \phi b = O$$

The values ϕh; ϕl; ϕb are the three chief strains and the flow stresses

[1] **The laws of plastic strain have been studied by Prof. Engin. Erich Siebel in his work: "Metal Shaping by Plastic Strain".**

give the values of k regarding ϕ.

★ ★ ★

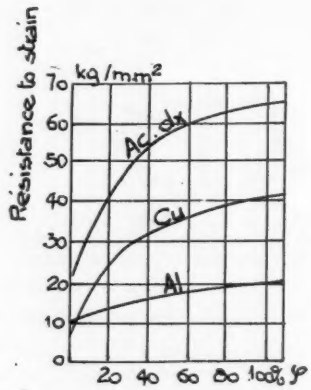


Figure 3.

The internal strain work is very easily expressed with regard to k and ϕ.

$$Tl = V \int_0^{\phi} k \, d\, \phi$$

In the above expression, V represents the strained volume.

★ ★ ★

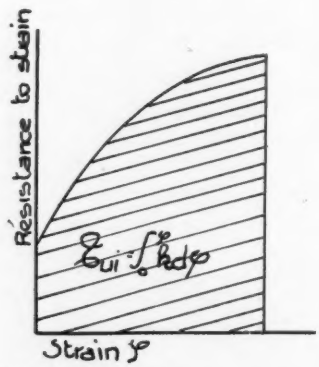


Figure 4.

The integral $\int_0^{\phi} k \, d\, \phi$ (work by volume unit) is therefore represented by the hatched surface among the flow curve, the axis of the abscisses and the ordinate ϕ.

★ ★ ★

The forward motion of the loom play carries along the weft wire and inserts it among the longitudinal wires.

★ ★ ★

As soon as the weft wire touches the longitudinal wires (fig. I) the play begins to show an insertion stress P.

★ ★ ★

During the insertion, the warp and weft waving increases gradually the resistance to wire strain increases and so does the stress P.

★ ★ ★

The action of force P gives way to forces FI and F2 on the longitudinal wires. The warp is stretched initially with tension TI.

★ ★ ★

FI and TI give a resultant RI which causes the waving of the warp, whereas the vertical component NI of – RI (directly opposed to RI) causes the waving of the weft.

★ ★ ★

We will not develop here the balance equations between the internal and external forces. We have stated those equations from the stress works and it results as follows:

$$(F, \cos \alpha + T, \sin \beta)\ t = m\ \pi\ \phi_2^2\ k_t \operatorname{Log} \sqrt{\frac{m^2 + t^2}{m^2}} \quad (I)$$

$$[F_1 - T_1 \sin(\alpha - \beta)] \sqrt{M^2 + t^2 - (\phi_1 + \phi_2)^2} = k_c \frac{\phi_1^3}{6} \quad (II)$$

★ ★ ★

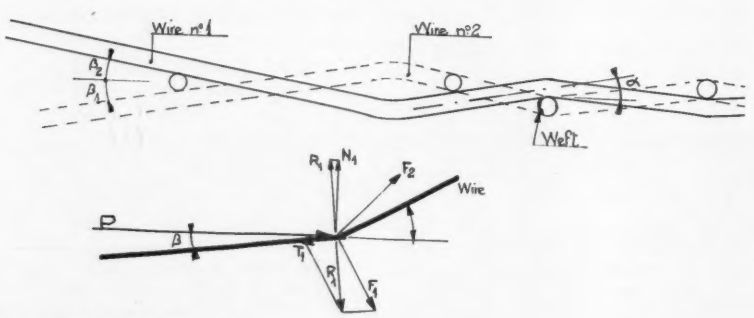


Figure 5. Wire Strain Stresses * * *

Let us eliminate FI between those two equations. We can now state the relation among the various weaving elements.

$$k_c \frac{\phi_1^3 \cos \alpha}{6 \sqrt{M^2 + t^2 - (\phi_1 + \phi_2)^2}} + T_1 \sin (\alpha - \beta) \cos \alpha = m\ \pi \frac{\phi_2^2}{t} k_t \operatorname{Log} \sqrt{\frac{m^2 + t^2}{m^2}} - T_1 \sin \beta \quad (III)$$

★ ★ ★

Explanation of the Equations

– **The equations** clearly show the influence of the tension. Increasing TI causes an opposition to the waving of the warp (equation 2).

★ ★ ★

On the other hand, the stress necessary to wave the weft is decreased by TI sin/3. It results that by increasing the tension of the warp, the waving of the weft is helped.

★ ★ ★

– **If we** diminish ϕI or kc while maintaining ϕ2;kt and TI, we can see that F1 decreases (equation 2).

Consequently, $\dfrac{\operatorname{Log} \sqrt{\dfrac{m^2 + t^2}{m^2}}}{t}$

must decrease and therefore t decreases.

★ ★ ★

The weft will wave less.

★ ★ ★

You must carefully keep from understanding the equations rigorously. The laws established to study plastic strain are not rigorously exact. Theory and practice give results 15% max. different.

★ ★ ★

But the stated equations indicate the direction of the influence of each factor and show the degree of importance of that influence. So, if you notice a bad result while weaving, you can remedy immediately by changing the warp tension or the quality of the weft wire (action on kt) or the diameter of this weft wire.

★ ★ ★

Above all, in a limit case, it is possible to know a priori whether a quality screen can be obtained.

★ ★ ★

Special Application to Rectangular Mesh Wire Screens

More and more, we have to make wire screens with rectangular meshes, such as: bronze n° 25x11 screen, n° 20x10 bronze screen, n° 22x8 stainless 18.8 screen, n° 14x5 stainless 18 x 8 screen.

★ ★ ★

All those screens are made with wires whose diameters are from 0.5 mm. to 0.7 mm. The longer side of the mesh is made by the warp wire. In such cases, it becomes very difficult to get sufficient waving of the weft wires if the same wire is used for the weft and for the warp.

★ ★ ★

In the long run, such made-screen strains, the warp wires slide on the weft wires which are not or not enough waved.

★ ★ ★

Equation III shows immediately how to remedy:

1°/ By increasing tension T up to max. consistent with a limited stretching of the warp wires.

2°/ By using warp wire with larger diameter than that of weft wire.

3°/ By using wire quality different for weft and warp, as the warp wire presents greater strain resistance than the weft wire.

★ ★ ★

Generally, for the above mentioned screens, we have obtained good results by using the three remedies simultaneously.

★ ★ ★

We modified the loom in order to get a total tension from 5 to 6000 Kgs on the warp (and it is not too much); for the warp, we use a wire one n° or ½ n° gauge bigger than for the weft.

★ ★ ★

At last, the weft wire usually employed is annealed, whereas the warp wire has been drawn once after annealing (reduced 10% or 20% according to cases).

★ ★ ★

Abacus for Rectangular Meshes

To make the conclusions of our study more useful in practice, we have changed equation III into an abacus.

★ ★ ★

That abacus intended to the study of rectangular meshes has been stated with a supposed tension of 5000 Kgs and a weaving breadth of 1 metre.

★ ★ ★

Suppose we have to make a rectangular mesh screen in soft steel (40-45 Kgs steel); Screen n° 14x5 (Engl. Inch.) stay wire $\phi 2 = 0{,}7$mm; warp wire $\beta 1 = 0{,}7$mm – 1 metre broad.

We have:

$m = 1,\ 3\ (\phi 1 + \phi 2)$

$\frac{M}{m} = \frac{14}{5} = 2,\ 8$

Looking at the line ABCDEFG as far as it meets with HG, we read in G that the stray wire waving will be included between the ½ and the 1/3 of the diameter of this wire.

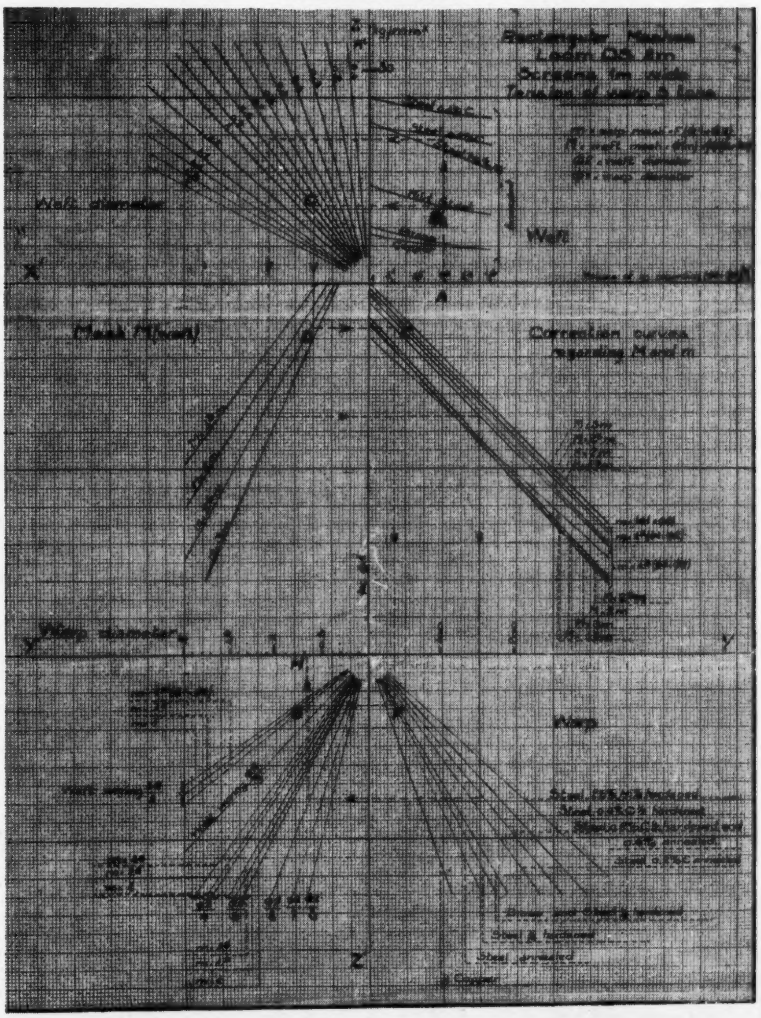
★ ★ ★

Consequently, there will be enough waving to get a good result. Not so if we used a high resisting wire. All other data being the same, the weft waving would not exceed 1/6 of its diameter.

★ ★ ★

The difference between the two results is because, in both cases, we have applied the same tension of 5000 Kgs, whereas the wire resistances to strain were approximately in the ratio of 1 to 2. So, the influence of the tension appears graphically.

Chart Showing Mesh



Dimensions and Weight of Fibrous Glass Applied to Wire and Cable Constructions

by Charles L. Meteer
and Paul L. Layton
Textile Products Division
Owens-Corning Fiberglas Corporation
New York, N. Y.

Fibrous glass yarns have grown in use steadily during the past few years. In this article, the authors provide users of these yarns with some practical data on the manner in which the yarn should be applied to electric conductors for best results.

In the last five years fibrous glass textiles have been engineered and designed into many cable constructions, as protective braids and wraps, supporting braids and wraps, as tension members, and as filler material. With the extensive development and research being carried on by the fibrous glass industry, with the wire manufacturers, as well as the insulation manufacturers, applications for permanent, high strength, fibrous glass materials are continuing to expand.

★ ★ ★

In addition to playing an important role under a peace-time economy, these materials are now being called upon to fill a vital need in our mobilization plan. These expanding applications have brought about a need for data on the dimensions of fibrous glass yarn of various constructions when applied in wire and cable applications, similar to those collected and available for other textiles which have been used by the wire and cable industry over a period of years.

★ ★ ★

Many manufacturers have some data on these dimensions for specific applications and in addition the agencies governing specifications have set up yarn spread constants for a limited number of applications.

★ ★ ★

This article is intended to correlate the yarn dimension data collected by the Textile Laboratory of Owens-Corning Fiberglas Corporation during the last ten years. In addition, this data has been used to develop formulae that have been put into nomographs or alignment charts that are intended to be a helpful tool for preliminary work in designing cable constructions involving fibrous glass. It should be kept in mind that results from these charts may not conform exactly to specification data already established, due to several variables involved, and likewise should not be used to determine specifications without further study of these variables.

★ ★ ★

Dimensions of Fiberglas Yarns Under Normal Braider Tension

In setting up yarn dimensions formulae it was first necessary to determine whether the following variables had to be considered in calculating the formulas: Yarn treatment, diameter of wire or conductor under braid or wrap, picks per inch, braider tension, and number of ends of yarn per carrier. The results of this study is listed in Table I and show that for the purpose of these formulae they need not be considered; however, in determining yarn constants for a specific application these variables may cause enough change in yarn spread and buildup to have to be considered. With this

(*Continued on page* 306)

TABLE I

Picks/ Inch		Diameter of Fiber Rod					
		3/16 inch			1/2 inch		
		150-1/0 3 E Plain	150-1/0 3 E Waxed	150-1/0 2 E Plain	150-1/0 3 E Plain	150-1/0 3 E Waxed	150-1/0 2 E Plain
10	Spread (w) mils	12.7	12.9	13.1	13.1	12.9	13.2
15		13.0	13.3	13.0	12.9	13.3	13.0
17		13.6	13.2	13.2	13.2	13.2	12.9
20		12.9	13.0	13.1	13.1	13.0	13.1
10	Build-up (T) mils	5.2	5.3	5.0	5.0	5.3	5.0
15		5.3	5.3	5.1	5.1	5.2	5.2
17		5.2	5.1	5.2	5.2	5.1	5.1
20		5.2	5.0	5.0	5.0	5.1	5.0

YES... WIRE MILL "ACIDOSIS" IS CURABLE!

EVERY wire mill has an "acid condition" which is mighty hard on its general health. It causes such things as corrosion of plant and equipment, which requires periodic treatments which run into a lot of money, labor costs being what they are today.

But, even worse than corrosion, which only affects the wire mill, is the acid disposal problem, which affects the entire community in most cases. Rivers, lakes and small streams are polluted beyond help. Sewage systems are ruined, much to the distress of the city officials. This is an old story to you—every wire mill has its own desperate disposal problem.

Isn't it nice to know that Magnus has the remedy for these problems? It's MAGICOAT*—the new oxide coating for drawing patented high carbon steels, annealed low carbon steels, and stainless and other alloy steels—WITHOUT ANY ACID CLEANING WHATSOEVER!

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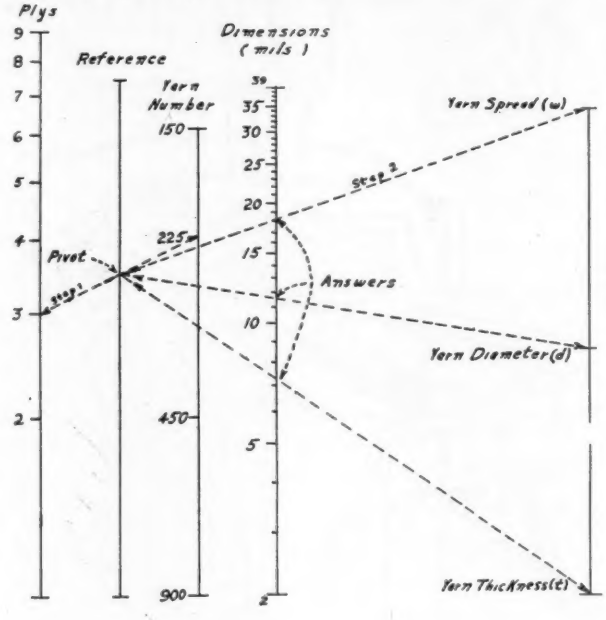
No. 1 — ALIGNMENT CHART FOR CALCULATING DIMENSIONS OF FIBROUS GLASS YARNS APPLIED TO WIRE AND CABLE



$$D = \frac{\sqrt{P}}{\sqrt{N}} \text{ X 100 MILS}$$

$W = D \times 1.6$

$T = D \times .625$

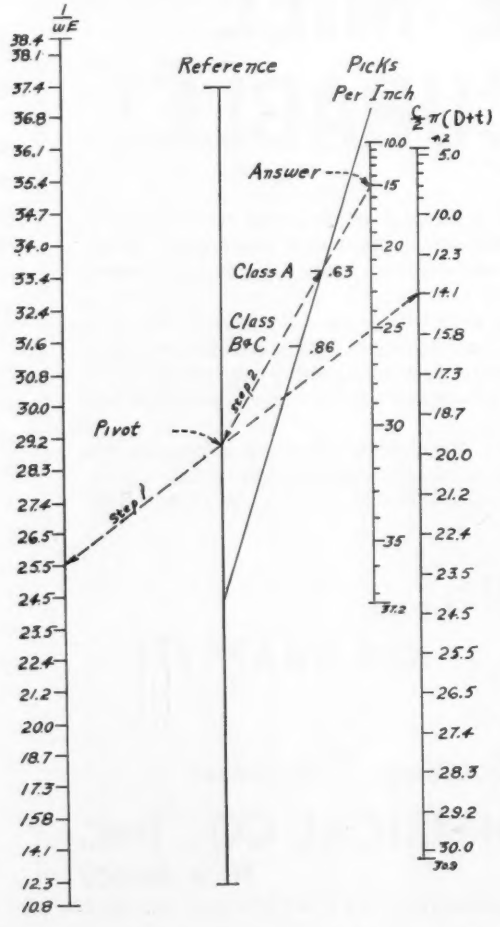
EXAMPLE: 150-3/2

$P = 6$

$N = 150$

Use this chart for preliminary work in determining the approximate yarn spread, yarn diameter, and yarn thickness of fibrous glass yarns applied to wires and cables. The yarn spread and yarn thickness will vary depending on tension, surface of conductor, number of ends, method of measuring, and other variables.

No. 2 — ALIGNMENT CHART FOR CALCULATING REQUIRED PICKS PER INCH FOR FIBROUS GLASS BRAID COVERED WIRES AND CABLES



C/2 π (D+T)				
(D+T)	12	16	24	36
.090-.110	21.2	28.3	--	--
.111-.125	17.2	23.0	--	--
.126-.150	15.1	20.2	30.2	--
.151-.175	12.7	16.9	25.4	--
.176-.200	10.9	14.5	21.8	--
.201-.225	--	12.7	19.0	28.5
.226-.250	--	11.3	16.8	25.2
.251-.300	--	10.1	14.2	22.8
.301-.350	--	8.5	12.6	18.9
.351-.400	--	7.3	10.8	16.2
.401-.450	--	6.3	9.6	14.4
.451-.500	--	5.7	8.4	12.6
.501-.600	--	5.1	7.6	11.4
.601-.700	--	4.2	6.4	9.6
.701-.800	--	--	5.4	8.1

ENDS	1/WE 150-1/0	1/WE 150-1/2
2	38.4	27.0
3	25.6	18.0
4	19.2	13.5
5	15.4	10.8
6	12.8	--

$$\text{PICKS/INCH} = K\sqrt{\left(\frac{1}{W\,E}\right)^2 - \left(\frac{C}{2\pi(D+T)}\right)^2}$$

K = .63 CLASS A BRAID
.86 CLASS B AND C BRAID

W = YARN SPREAD (INCHES)

E = NUMBER OF ENDS PER CARRIER

C = NUMBER OF CARRIERS

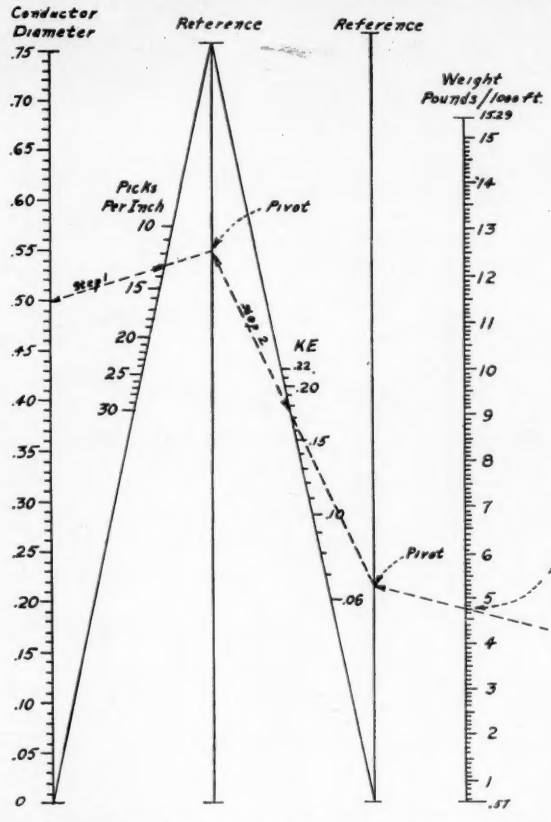
D = DIAMETER CONDUCTOR

T = YARN THICKNESS

Use this chart for preliminary work in determining the approximate picks per inch to use in braid constructions using fibrous glass yarns. The amount of coverage will vary directly with the spread of the yarn and depends on tension, surface of the conductor, number of ends, method of measuring, and other variables.

Results from this chart may not conform exactly to specification data, therefore, should not be used to determine standard values.

No. 3 — ALIGNMENT CHART FOR CALCULATING POUNDS OF FIBROUS GLASS USED PER 1000 FEET OF BRAID COVERED WIRES & CABLES



	K E 150-1/0				
ENDS	2	3	4	5	6
	.072	.114	.144	.180	.216

	C/2 KE 150-1/0				
	ENDS	2	3	4	5	6
CARRIERS:	16	.58	.91	1.15	1.44	1.73
	24	.86	1.36	1.73	2.16	2.59

WEIGHT/1000 FT. OF BRAID CONSTRUCTION

$W = (D \pi P_1 + C/2)\ K\ E$

D = DIAMETER OF CONDUCTOR

P_1 = PICKS/INCH

C = NUMBER OF CARRIERS

E = NUMBER OF ENDS PER CARRIER

$K = \frac{5.35\ P}{N}$

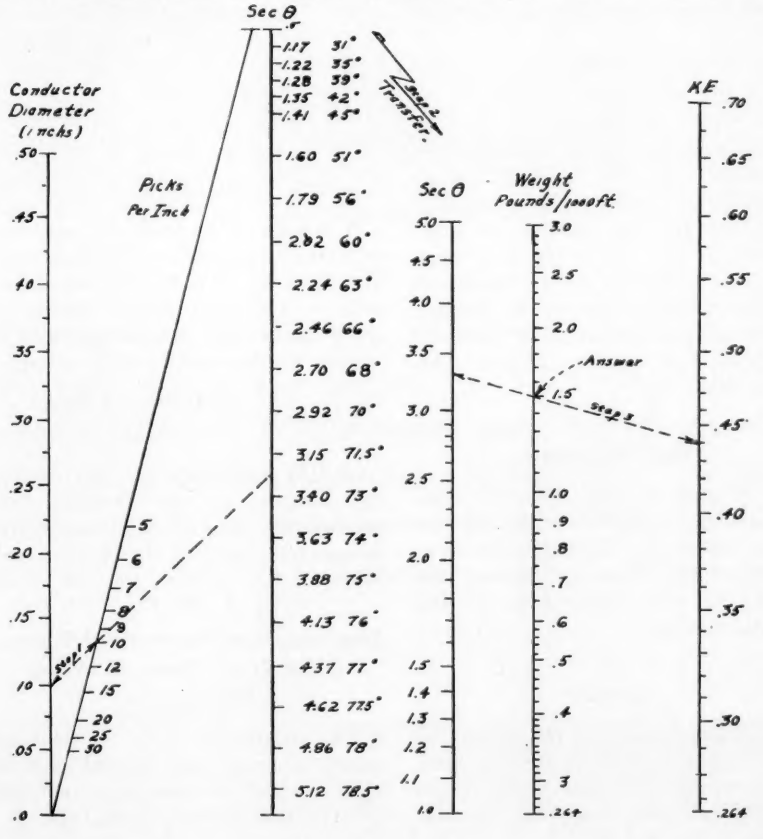
P = NUMBER OF PLIES

N = BASIC YARN NUMBER

THE VALUES OF WEIGHT OBTAINED FROM THE CHART ARE BASED ON THE YARDAGE OF PLAIN YARN. WHEN USING TREATED YARN, MULTIP PLY THE WEIGHT OBTAINED FROM THE CHART BY A FACTOR EQUAL TO THE RATIO OF THE YARDAGE OF PLAIN YARN TO THE YARDAGE OF THE TREATED YARN.

EXAMPLE: THE FACTOR FOR 150-1/0 STANDARD WAXED YARN = $\frac{14,700}{12,600} = 1.2$

No. 4 — ALIGNMENT CHART FOR CALCULATING POUNDS OF FIBROUS GLASS USED PER 1000 FEET OF WRAP COVERED WIRES & CABLES



TOTAL ENDS	K E 150-1/0
12	.264
14	.308
16	.352
18	.396
20	.440
22	.285
24	.528
26	.572
28	.616
30	.660
32	.704

WEIGHT/1000 FT. WRAPPED CONSTRUCTION (SINGLE WRAP, NO BINDER, PLAIN YARN)

WEIGHT = K E SEC θ

$K = \frac{3.3\ P}{N}$ N = YARN NUMBER, P = NUMBER OF PLIES

E = NUMBER OF ENDS

θ = ANGLE BETWEEN GLASS YARN AND A LINE IN THE BRAID SURFACE PARALLEL TO THE AXIS OF THE WIRE.

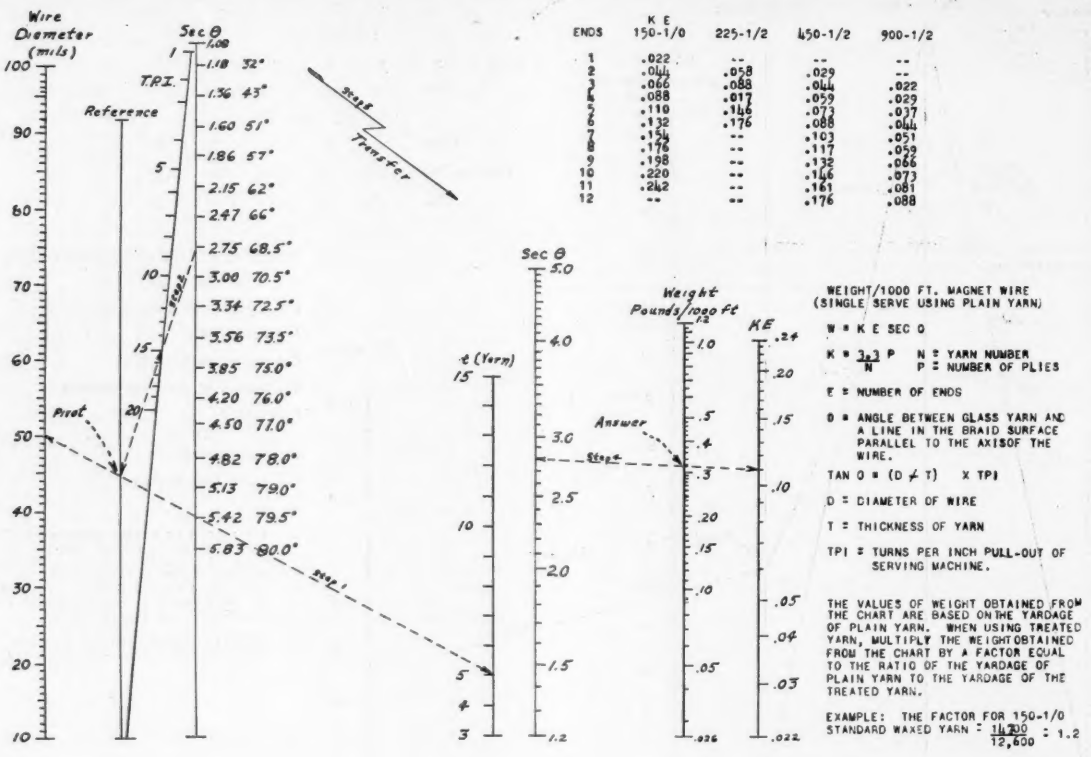
TAN θ = D π X P_1

P_1 = PICKS PER INCH

THE VALUES OF WEIGHT OBTAINED FROM THE CHART ARE BASED ON THE YARDAGE OF PLAIN YARN. WHEN USING TREATED YARN, MULTIPLY THE WEIGHT OBTAINED FROM THE CHART BY A FACTOR EQUAL TO THE RATIO OF THE YARDAGE OF PLAIN YARN TO THE YARDAGE OF THE TREATED YARN.

EXAMPLE: THE FACTOR FOR 150-1/0 STANDARD WAXED YARN = $\frac{14,700}{12,600} = 1.2$

No. 5 — ALIGNMENT CHART FOR CALCULATING POUNDS OF FIBROUS GLASS USED PER 1000 FEET OF SINGLE SERVE COVERED MAGNET WIRE


Wire Diameter (mils)
Sec θ
T.P.I.
Reference
Steps
Transfer
Pivot
Answer
t (Yarn)
Weight Pounds/1000 ft
KE
WEIGHT/1000 FT. MAGNET WIRE (SINGLE SERVE USING PLAIN YARN)
W = K E SEC θ
K = 3.2 P / N
N = YARN NUMBER
P = NUMBER OF PLIES
E = NUMBER OF ENDS
θ = ANGLE BETWEEN GLASS YARN AND A LINE IN THE BRAID SURFACE PARALLEL TO THE AXIS OF THE WIRE.
TAN θ = (D + T) X TPI
D = DIAMETER OF WIRE
T = THICKNESS OF YARN
TPI = TURNS PER INCH PULL-OUT OF SERVING MACHINE.
THE VALUES OF WEIGHT OBTAINED FROM THE CHART ARE BASED ON THE YARDAGE OF PLAIN YARN. WHEN USING TREATED YARN, MULTIPLY THE WEIGHT OBTAINED FROM THE CHART BY A FACTOR EQUAL TO THE RATIO OF THE YARDAGE OF PLAIN YARN TO THE YARDAGE OF THE TREATED YARN.
EXAMPLE: THE FACTOR FOR 150-1/0 STANDARD WAXED YARN = 14,200 / 12,600 = 1.2

ENDS	K E 150-1/0	225-1/2	450-1/2	900-1/2
1	.022	--	--	--
2	.044	.058	.029	--
3	.066	.088	.044	.022
4	.088	.017	.059	.029
5	.110	.146	.073	.037
6	.132	.176	.088	.044
7	.154	--	.103	.051
8	.176	--	.117	.059
9	.198	--	.132	.066
10	.220	--	.146	.073
11	.242	--	.161	.081
12	--	--	.176	.088

data and the accumulation of yarn spread, buildup, and diameter data on file the following formulas were developed:

$$D = \text{Diameter} = \frac{\sqrt{P}}{\sqrt{N}} \times .1 \text{ inches}$$

$$W = \text{Spread} = \frac{\sqrt{P}}{\sqrt{N}} \times .16 \text{ inches}$$

$$T = \text{Build up} = \frac{\frac{\sqrt{P}}{\sqrt{N}}}{.16} \text{ inches}$$

P = The number of basic strands plied and twisted together.

N = Basic strand number.

Example 150-3/3
N = 150
P = 9

The diameter of the yarn is the dimension before applied to wire and cable (the diameter of the yarn in free air.

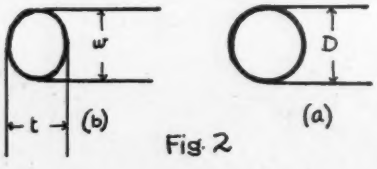


Fig. 2

When the yarn is applied to a wire it approaches an eliptical shape as shown in Figure 2-b, the minor axis of the elipse is called yarn thickness and the major axis yarn spread.

★ ★ ★

These calculated formulas were checked with the test procedure listed below and results compared satisfactorily for normal braider tension from 4 to 8 oz. and plied yarns through nine ply. For different braider tensions and yarns heavier than nine ply further study must be made to determine a different constant than .16.

★ ★ ★

Test Procedure

3/16 and ½ inch diameter fiber rods were braided with various yarns subjecting the variables previously listed. The yarn spread and thickness were checked in the following manner.

★ ★ ★

Spread:

A microscope with a cross hair line with one mil divisions was used. An average of ten readings was recorded and the value Total Spread/E is reported. Note: There are a few fibers which are broken up or spread more than average, also, there is a slight increase in spread where the yarns cross over. Readings were not taken at the points listed above.

★ ★ ★

Build-up:

A sample of the braid was slit and removed from the braided fiber rod. The thickness of braid was measured with a dial micrometer having a presser foot of .4 in. diameter and a weight on the sample of 50 grams.

$$\text{Build-up} = \frac{\text{Thickness of Braid}}{2}$$

A.S.T.M. subcommittee on textiles has a committee now studying test procedures for fibrous-glass yarn dimensions applied to wires and cables.

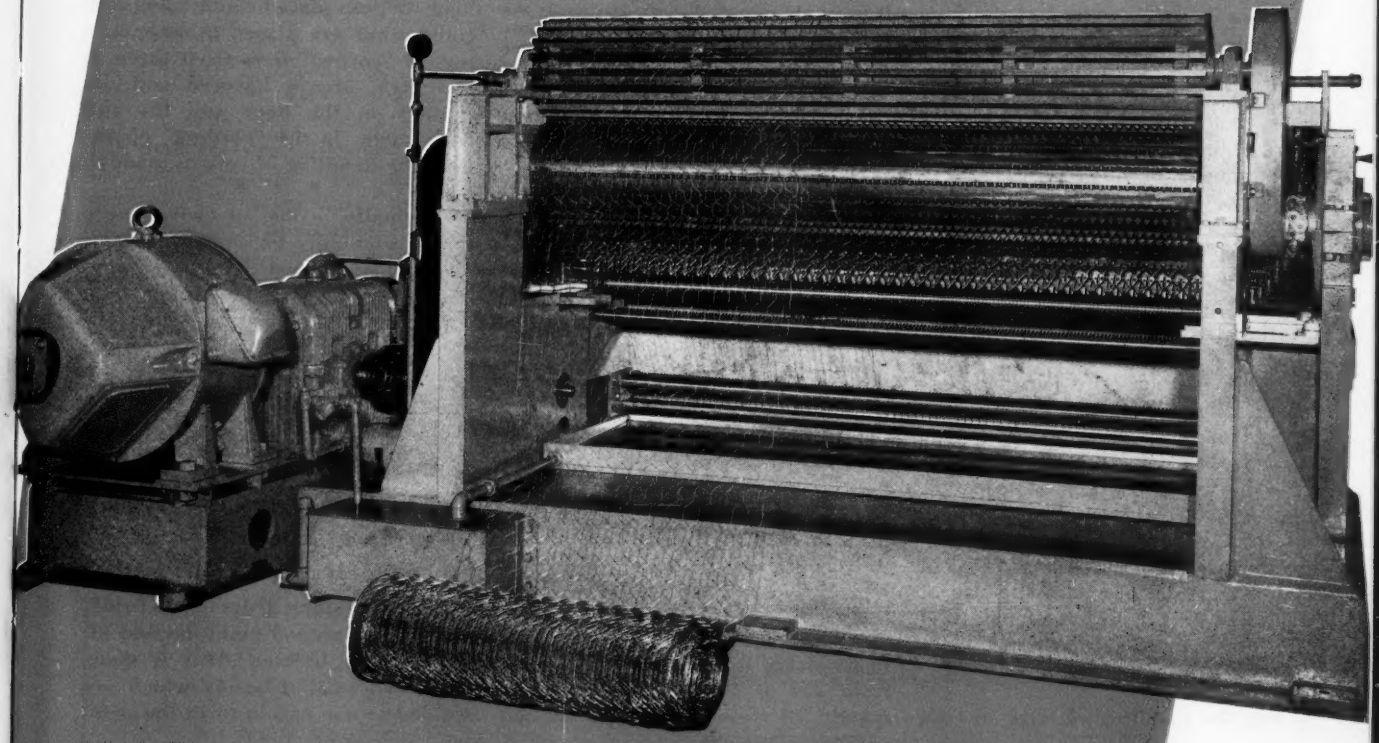
★ ★ ★

Required Picks Per Inch Of Fibrous Glass Braid Covered Wires And Cables

The number of picks per inch required to meet class A and class B and C braid coverage is dependent

(*Please turn to page* 338)

NEW Wean HEXAGON NETTING MACHINE PRODUCES MORE THAN 100 FEET PER MINUTE



Wean Wire Machinery is engineered and built to give you the last word in modern, up-to-date, high efficiency equipment. Just as the pictured hexagon netting machine doubles or triples present production, so do other Wean machines — both process and product — lead the way in boosting production, lowering costs and assuring better wire products.

If you're making or processing wire and want to be sure of the best — look to Wean — pace setter in wire machinery.

Wean Equipment Corporation
CLEVELAND, OHIO

Material Handling Methods of Southern Electric Corporation

It is an old saying that experience is the best teacher. The Southern Electrical Company's method of handling rods and wire are naturally adapted to their plant layout, but in it others may find ideas that can be adapted to good advantage.

Since the greater part of the task of material movement at its wire mill consists of handling coils and spools of copper, aluminum, or steel wire and cable, the management of the Southern Electrical Corporation, Chattanooga, Tenn., manufacturers of wiring cable and conductors, wanted to find some better method of utilizing its fleet of four, 6,000-lb. capacity, storage battery-powered highlift platform trucks for the work. Plant engineers and shop men devised and constructed two devices to fit on the platforms, one for handling coils, the other to handle large spools, or reels. Both devices can be attached to, or removed from, the trucks in a matter of seconds, through formed steel pieces welded to the back plates of the trucks' platforms. These pieces do not, in any way, interfere with the use of the trucks for conventional skid platform handling.

★ ★ ★

For the handling of wire in coils —on receipt, into storage, thence into process and finally, as wrapped coils, into outward shipment—a piece of railroad T-rail, approximately 10 feet long is used. At one end a piece of steel, with a projecting lug, has been welded. This lug fits into a clamp, or socket, which is welded onto the back plate on the truck platform. The rail is covered with a piece of automobile tire casing held to protect the coils from unnecessary abrasion.

★ ★ ★

When coils of wire are unloaded from railroad cars, the truck is moved up to the car door and the platform raised about 2½ feet. Coils are placed on projecting T-rail manually. Each coil, as received, weighs from 250 to 265 pounds. Approximately 20 coils are carried in one load. When placed in storage the coils either are placed in interlocking, or "corded" tiers from three to five high, or are lowered and deposited on the floor and the rail withdrawn. In the "cording" operation, the handling of coils is manual.

★ ★ ★

Originally, coils of wire were placed manually on the truck platform, then moved to storage and manually unloaded. It would take approximately four and a half man-hours for the unloading and storaging of a carload of wire of a total weight of between 75,000 and 80,000 pounds. With the T-rail device the operation's time, employing two trucks, has been reduced to approximately 45 minutes, with four men at work, or a total of three man-hours.

★ ★ ★

In the handling of spools and reels of wire the second plant-devised attachment is utilized. This is made from two small I-beams which are welded at one end to form the point

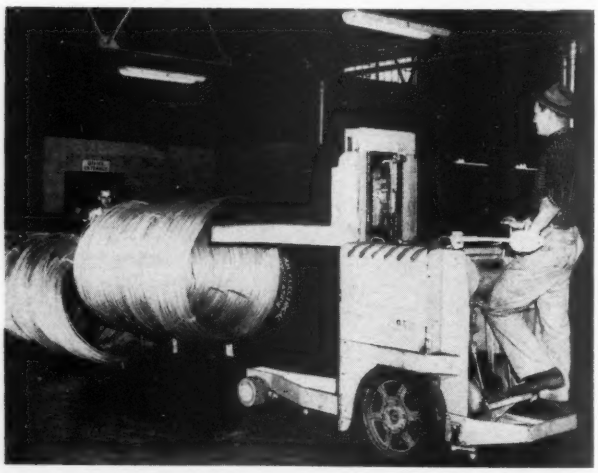


Fig. 1 — Placement in, or removal from, storage of large coils of heavy wire, used in the manufacture of wiring cable and conducto s has been simplified through use of a plant-devised attachment for a storage battery-powered highlift platform truck. It consists of a 10-foot length of railroad T-rail, to one end of which has been welded a lug that fits into a socket welded to the back-plate of the truck's platform. The bearing surface of the T-rail has been covered with a piece of auto casing held with steel straps. As much as 5,000-lb. of wire in coils is handled in a single operation.

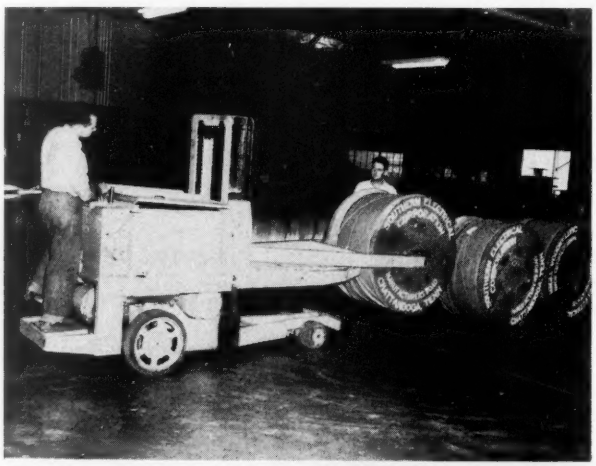


Fig. 2 — Reel-handling attachment, shown in above picture, was devised and built at the plant for use with its fleet of storage battery-powered highlift platform trucks. Made from two lengths of I-beams, welded at one end to form a "vee", a projecting lug fastens into a socket welded to the back-plate of the truck's platform. Seats for holding a mandrel are welded at the end of each of the long legs of the "vee". The device permits of ease in the handling and placement of the large reels.

of a "vee." About two feet from the point, to which a projecting lug similar to that used with the T-rail has been welded, the legs are bent back parallel and a cross-brace welded between them. At the far end of each leg a seat for a round rod, or mandrel, has been welded. In use the attachment is fitted under the steel piece welded to the backboard of the truck, and the body rests on the platform, the parallel legs extending horizontally beyond the platform's end.

★ ★ ★

A mandrel is run through the center hole of the spool and the truck moves up, with platform lowered, until the seats are under the rod. When the platform is raised the spool likewise is raised from the floor and is then carried to wherever it is to be used. In the case of small spools this usually is at the end of the stranding machines. The larger reels, containing finished product, are handled in like manner.

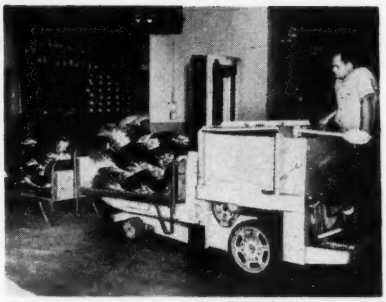


Fig. 3 — The Southern Electrical Corporation, manufacturers of wiring cable and conductors, also use conventional type skids, fitted with end-boards, for the handling of small coils of wire by means of storage battery-powered high-lift platform trucks.

★ ★ ★

Each of the four trucks can raise its platform to a height of 58 inches, and sometimes are utilized by the maintenance crew for work about the plant, while they also are used to handled skid-loads of various materials.

★ ★ ★

The trucks were acquired when the plant began operations in February, 1947, and they have enabled the company to maintain speed of production and have helped speed up shipping. Flow of raw material from receipt into storage and in process likewise has been accelerated. With the trucks in service eight hours a day, it is said that if the work done by the trucks had to be performed by manual means, they would need another thirty to forty men in the plant.

★ ★ ★

This method of handling materials, because of low operating costs and consistent dependability, is considered by company executives to have been a sound investment, after nearly three years of observation and cost keeping.

A Final Reminder to Attend . . .

THE CANADIAN REGIONAL MEETING!

THE PLACE: HAMILTON, ONTARIO, at the ROYAL CONNAUGHT HOTEL.

THE TIME: THURSDAY and FRIDAY, APRIL 19th and 20th, 1951.

THE PROGRAM: Technical papers will include the following: HISTORY OF INSULATED WIRE AND CABLE IN CANADA, NYLON FIELD WIRE DEVELOPMENT, ELECTRIC DRIVES IN WIRE MILLS, and WIRE FOR FASTENERS. There will also be a plant inspection visit to the mills of B. GREENING WIRE CO., LTD.

No pains have been spared by the Canadian Regional Meeting Committee to make this meeting both profitable and pleasant. Every wire man who can possibly get away should make it a point to attend. It will be well worth while.

If you have not returned your hotel reservation card, please do so at once. If you did not get a card, write today telling us what accommodations you will want.

BRING YOUR WIFE, TOO. PLANS HAVE BEEN MADE TO ENTERTAIN THE LADIES.

See WIRE AND WIRE PRODUCTS for March for program details

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THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET **STAMFORD, CONN.**

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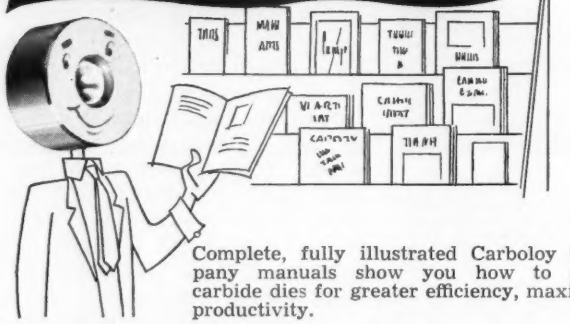

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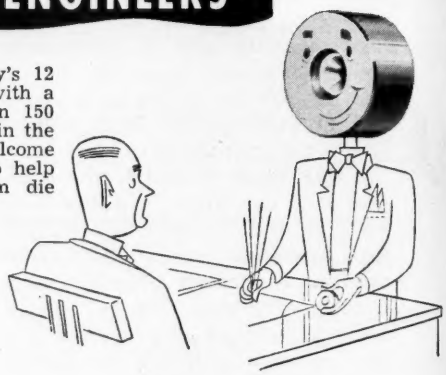

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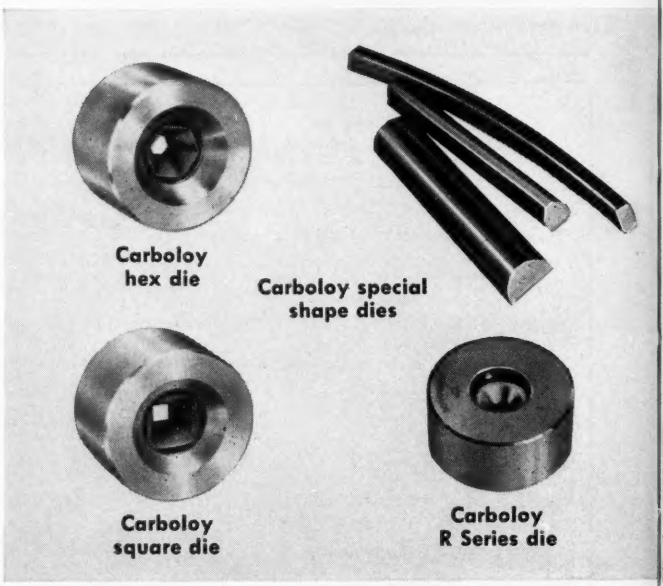

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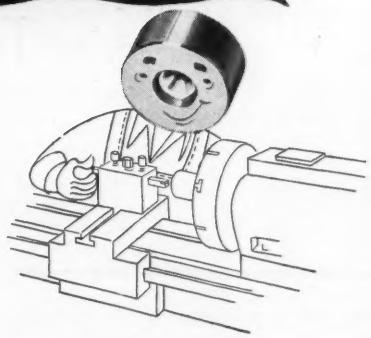

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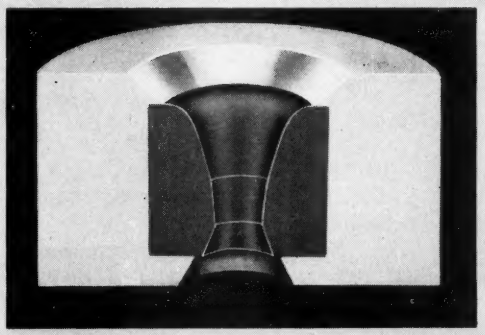

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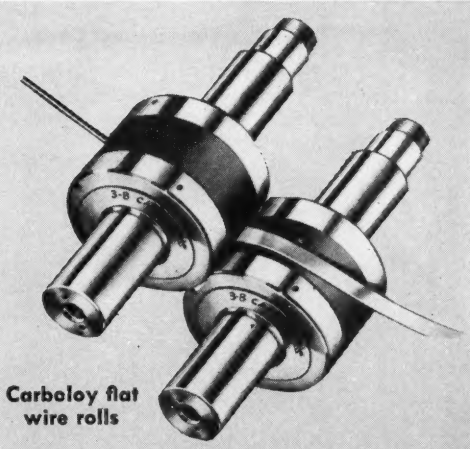

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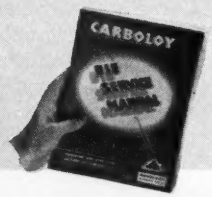

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Application of Logarithmic Strain Ratios To Tube Drawing

by Jean Tranier,
Ingénieur des Arts et Métiers
Marseilles, France

An article by Yves Dardel published in the February, 1949, issue of WIRE AND WIRE PRODUCTS, entitled "A New Drawing Chart for Tubes", has elicited an answer by Jean Tranier. In this article the author describes a method he has found practical to determine the stresses to which seamless tubing will be subjected, thus avoiding production difficulties that otherwise might be encountered.

In the manufacture of seamless tubes, the cold drawing process is often handicapped by the tediousness of percentage reduction calculations.

★ ★ ★

In the absence of a quick and convenient way of making such calculations, it may be said that it is somewhat difficult to assess from tests the optimum deformation capacity of a given metal, in terms of possible reduction between passes and overall reduction between anneals. It is still more difficult to reproduce in the shop the results of tests, should they be made, when the production program calls for the drawing of a variety of sizes, with a limited number of tools.

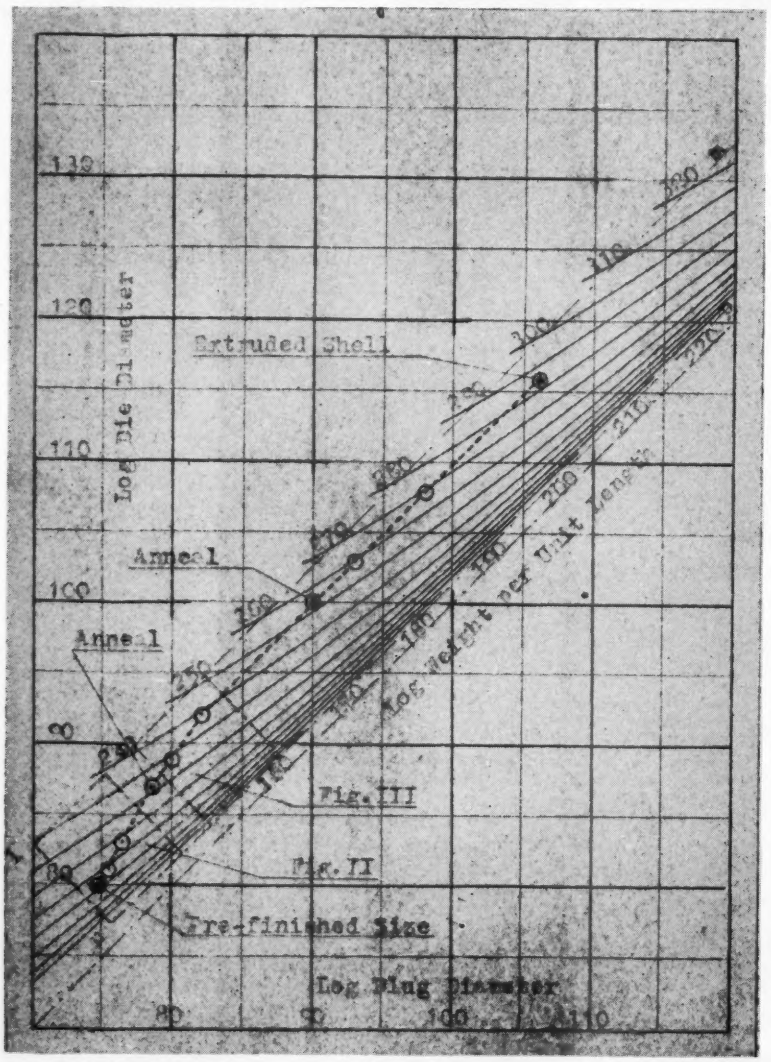

Figure I

★ ★ ★

The method outlined here allows for a real "plotting" of the drawing operations on a graph and the reading of either diameters, cross sectional area or percentage reduction with an equal accuracy whatever is the size of the tube.

★ ★ ★

Basic Principle

The principle of the method lies in the use of logarithms instead of actual sizes.

★ ★ ★

If we draw on logarithmic paper the curve representing the tubes of equal cross sectional area, we have a curve similar to any one of those represented on Fig. 1. By successive translations of this original curve, all the useful zone of the graph is covered with curves representing tubes having cross sectional area in arithmetic progression.

★ ★ ★

Practical Presentation

In practice the useful zone is limited to two parallels to the asymtote, 1m & np, Fig. I, which represent respectively tubes having a given ratio between thickness and diameter. These limits were fixed at Thickness = ⅛ diameter and Thickness = 1/64 diameter. For convenience of use, this zone was then divided up in small sections overlapping each other. All sections be-

ing graphically identical are obtained as blue prints from the same master tracing. Two such sections, shown chain dotted on Fig. I, are reproduced at a reduced scale on Fig. II & Fig. III.

★ ★ ★

Numbering

In order to avoid numerous decimals and negative logs, the ordinates were taken as the log of the diameters measured in tenth of an inch and multiplied by 100; thus a diameter of 1″ is represented by the ordinate 100. The numbers indexing each curve are the logs of the weight per foot, measured in .001 lb, similarly multiplied by 100; thus a tube weighing 1 lb per foot is represented by the curve 300.

★ ★ ★

Calculation of Percentage Reduction or Elongation

The elongation per pass, generally measured in common practice by the formula $\frac{S-s}{s} \times 100$, is best replaced here by the Logarithmic Strain Ratio

$$\log R = \log S - \log s$$

Considering points A & B of Fig. III, for example: "A" represents a tube known as 92 x 82 (240), meaning that its external diameter is 0.8318″; internal diameter is 0.6607″; weight per foot is 0.2512 lbs. Similarly "B" represents a tube known as 89 x 80 (230) whose external diameter is 0.7762″; internal diameter is 0.6310″; weight per foot is 0.1995 lbs. In this case the Logarithmic Strain Ratio is measured by the difference 240 – 230 = 10, corresponding to log R = 0.10 or, in general terms to 26% elongation or 20% reduction of section.

	I Sections:	II Out. Dia:	III Ins. Dia.	
Extruded at	288	116	106	
Drawn to	272	108	98	
	262	103	93	
	256	100	90	
	Annealed and cut in two			
Drawn to	240	92	82	Point (A)
	230	89	80	" (B)
	224	87	79.6	" (C)
	Annealed and cut in two			
Drawn to	208	83	76.2	" (D)
	198	81	75.2	" (E)
Prefinished at	192	80	74.8	" (F)

★ ★ ★

This difference is quickly obtained by a simple reading of the diagram.

★ ★ ★

Application to Practical Tube Drawing

1°) — Determination of Passes

In the particular case where this method was first applied, we had marked the dies and plugs with the logarithms of their diameters. We had one die for each ordinate of the graph and five times as many plugs. Our series of dies thus ran: 125 = 1.778″, 124 = 1.738″, 123 = 1.698″, 122 = 1.660″, etc., and our plugs: 115 = 1.413″, 114.8 = 1.406″, 114.6 = 1.400″, 114.4 = 1.393″, 114.2 = 1.387″, 114 = 1.380″, 113.8 = 1.374″, etc.

★ ★ ★

We had then determined by experience the most convenient sequence of draws to suit our material (5T4 Light Alloy): starting from an annealed blank, three draws giving the respective Logarithmic Strain Rations of 0.16 – 0.10 – 0.06, making a total of 0.32, or "32 points" as we used to call it. After which, the tube having slightly more than doubled its length (to allow for the repointing of both halves), was cut in two and annealed again.

★ ★ ★

Supposing we had to draw a dural tube of ⅝″ x 20g from a shell obtained on a 1,000 ton press. This tube would have to be drawn approximately to 0.6310″ x 0.5590″ before heat treatment, to allow for sizing and straightening. Translated into logs, this tube will be known as 80 x 74.8, (and) its section index, obtained from the chart, is 192 (Fig. II).

★ ★ ★

Adding to this number 32 points again and again gives 224 and 256, which are the intermediate sections at which the tube will have to be annealed, and 288, which is a section obtainable on a 1,000 ton press, a suitable size being 116 x 106 (288). It only remains now to plot on the chart suitable sizes giving the successive cross sections as per column I of the table above and for which tooling is known to exist, such as columns II & III.

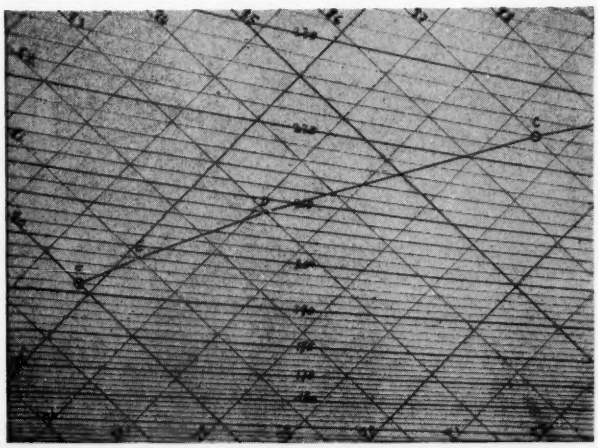

Figure II

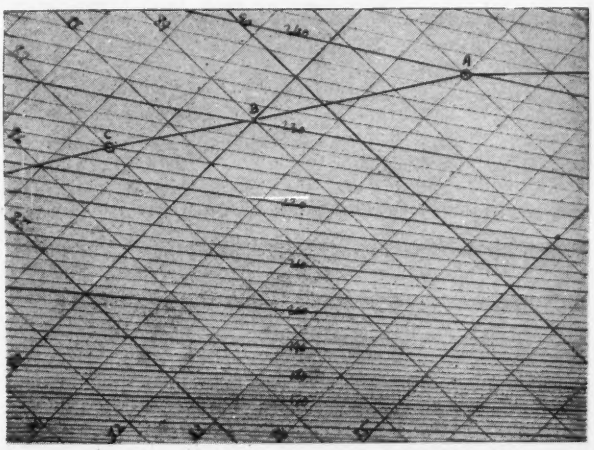

Figure III

It will be appreciated that a great latitude exists as for this choice, and should a die selected, for instance 92, of the set 92 x 82 (Fig. III) not be available at the time it is required, it is a matter of seconds for a foreman to select from the chart another set of tools such as 91 x 80.4 or 93 x 83.6 (Fig. III), which give the same sectional area and therefore the same Strain Ratio.

★ ★ ★

Other Advantages

Another example will show how the use of the method helps in minimizing capital investment in drawing dies. Should a die, say 83 (measuring 0.6761″) wear out of size, it is immediately repolished to the smallest possible size, measured, then its new diameter, say 0.6776 translated into log = 83.1 and the ordinate representing this new die is drawn in ink on the chart instead of the old 83, (Fig. II). When plotting a drawing sequence it is just as easy to deal with the die 83.1 than with 83.0. Should the die break out in the middle of a drawing operation, it is again only a matter of seconds for the foreman to pick up another set die-plug giving the same Strain Ratio and thus keep the work flowing through his department.

★ ★ ★

We also made great use of this method for salvaging shells which, for one reason or another, had been set aside during drawing—generally when the plug had failed to bite, the shell was drawn hollow, and was therefore unable to follow its original batch. Those stray shells were immediately gauged, their diameters translated into logs and their cross section ascertained from the chart. An individual tag was attached to each of them, giving such indication as 90 x 80 (236), and the shells stored vertically along a wall in small groups according to their section. Once monthly we made a special batch of them, drawing them to a sequence giving preferably thick walled tubes—as most of them were —starting from the biggest cross section available, and each group of shells fell in line for drawing at the first, second or third pass according to their section. By this method, all stray sound shells were salvaged to a usable finished size with no waste of time.

★ ★ ★

A last example of usefulness is the ease in the choice of the length of shells or blanks in order that the finished tube be of a convenient length when drawn. This operation resumes itself into a mental subtraction when using the chart and can, therefore, be applied down in the shop by the foreman himself.

★ ★ ★

Conclusion

This method was originally elaborated with the sole intention of simplifying draft calculations. But after only a short trial we found that it was indeed a real method of cold drawing, die maintenance and production management.

★ ★ ★

It has one great advantage in that it helps the intelligent but uneducated worker to understand the principle of Strain Ratio in cold drawing. It has, in fact, eradicated in our factory the unfortunately too common practice to refer to draws in terms of "so many thous" and, in this respect, has been a great asset towards proper tube mill operation.

★ ★ ★

This paper was originally published in the British Journal "Metal Treatment". The manuscript was sent to us by the author and it is published with the permission of "Metal Treatment."—Ed. Note.

For those on the West Coast the 1951 Regional Meeting, will be held at San Francisco, California, on June 15th, at the SIR FRANCIS DRAKE HOTEL—on Friday.

While primarily designed for West Coast wire men, all wire men are invited to attend. These meetings have been enthusiastically received in past years and the Committee has made plans that will uphold this reputation

The program includes a plant visit to the California Wire Cloth Corp. Plant, Oakland, Cal., a technical paper on "Woven Wire Cloth" and a special exhibit of wire cloth types. Other features will add to the interest and value of the meeting.

Make your reservation for hotel facilities now. Cards have been mailed to members, but write if you did not get one and want to attend.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET **STAMFORD, CONN.**

A New Hand Operated Spring Coiler Proves Useful in Industry

In this article an interesting and useful device is described that has proven its worth in experimental work, in short runs of special spring making and other applications. The many practical uses to which the coiler may be put have made for it a definite place in many manufacturing enterprises.

Small, medium and large size manufacturing plants often need small quantities of springs for experimental work, and for short production runs. The difficulties encountered in obtaining small quantities and their high cost have given impetus to spring making within the plants requiring such springs. This has been made through a low-cost, highly accurate, hand operated spring coiling machine which has recently become available. It is manufactured by The Carlson Company, 277 Broadway, New York 7, N. Y., covered by patent No. 2513-916, and is known as the Carlson Spring Coiler No. 1.

★ ★ ★

Although there are more than 300 spring manufacturing companies in the United States specializing in the manufacture of mechanical springs, these companies, for the most part, prefer to manufacture springs in large quantities of 500 to many millions. Some of these companies will make small-lot orders to desired specifications, but their prices for such springs are considered by many plants to be somewhat high.

★ ★ ★

This new spring coiler is especially useful for making small quantities of springs from 1 to 500, and is easily and quickly set up by inexperienced operators. The machine makes compression springs with coils closed or squared on both ends, extension springs tightly wound, close wound, or open wound, and torsion springs right or left hand wound with short or long extended arms.

★ ★ ★

Some of the large companies using this machine are The General Motors Corporation, Bendix Aviation Company, and the Westinghouse Electric Company. Among the medium size companies who have found this machine useful are the Veeder-Root Corporation, Ronson Cigarette Lighter Company, and the Taller & Cooper Company. Smaller companies who have found this machine useful are the Brooks Equipment Company, Rochester Products Corporation, and the Lundahl Corporation.

★ ★ ★

Many other firms in each category have also found it a valuable addition to their plant equipment. Quite a few spring manufacturing companies have also installed this machine in their small order departments, including the Wallace Barnes Co., the Newcomb Spring Corporation, the Milwaukee Spring Company, the Wilson Spring Company, the Connecticut Spring Corporation, the Wm. D. Gibson Spring Co. and many others.

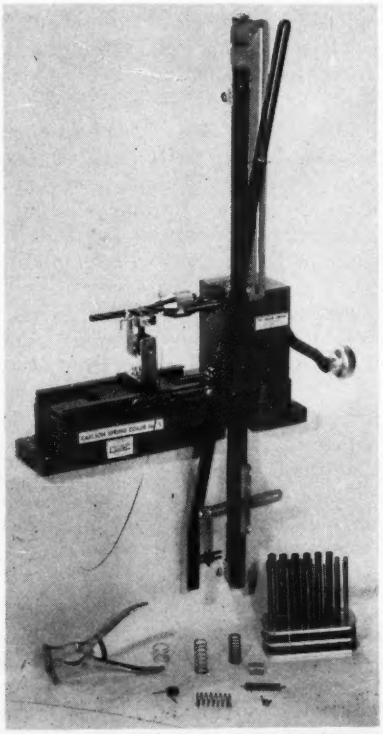

Fig. 1 — Carlson Spring Coiler No. 1 setup and ready for operation.

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Several firms were questioned recently concerning the efficiency of this machine in their shops and their reasons for purchasing such a spring coiler; some of their answers are as follows:

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Firms A and B both stated they often require small quantities of new types of springs in their equipment, but they had no way of determining specifications or load and deflection characteristics. It is now a simple matter for them to make several slightly different sample springs on their coiling machines for experimental purpose, try them out in actual operation, select the spring that gives the desired results, and then make as many as are required. And, after setting up the coiler, all springs made are uniform.

★ ★ ★

Firm C, a manufacturer of toll collection equipment, switchboards, electronic controls, and other types of power-controlled apparatus, often require 20 to 30 springs of about a dozen types. They now find it to their advantage to make their own springs at the time they are required for assembly rather than to proceed with the laborious process of requesting several spring manufacturing companies to quote on small, miscellaneous quantities, issuing purchase orders to the lowest bidder, waiting for delivery, making out receiving tickets, checking invoices, mailing checks, posting accounts and a multitude of other small handling, and expensive, operations that are required when making purchases. This firm recently was in urgent need of 300 compression springs to be made from 0.057″ phosphor bronze wire, with a ¾″ outside diameter, 2″ long, having 10 total coils. The spring coiler was set up in 3 minutes, and the

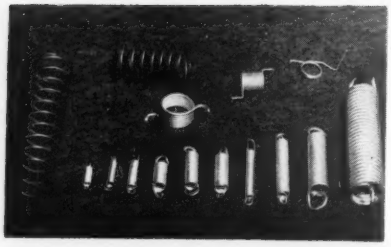


Fig. 2 — A typical group of springs for use in toll registering equipment made on this new coiler.

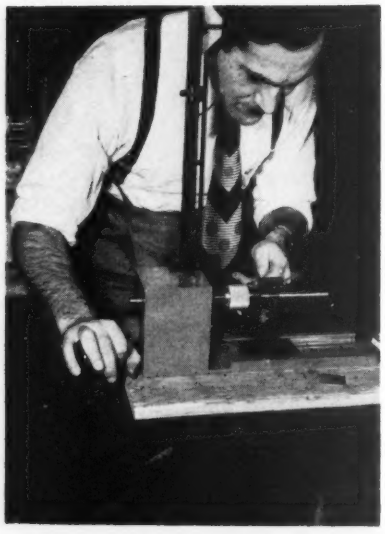


Fig. 4 — Winding a torsion spring with extended arms.

Fig. 6 — A compression spring being wound with both ends closed and square with the axis.

300 springs were wound in about 1 hour, thereby saving much valuable time.

★ ★ ★

Firm D, a manufacturer of solenoid valves, in sizes from ⅛″ up to 12″ for various types of service, and for pressures up to 1,500 lbs. per square inch, found that exceptionally accurate springs were needed to make the solenoid valves work correctly. They discovered it was possible to wind the springs they required on this new type spring coiler thereby saving them the time and trouble of giving a 100% load and deflection test to purchased springs. This company also found it essential to have the end coils on both ends of compression springs closed squarely with the axis of the spring, and to have each spring exactly alike. This they were able to accomplish with their new spring coiler. If this were not done, the springs would buckle, bind the valve parts, cause unequal loading, and chattering in the valves.

★ ★ ★

Many other types of companies including aircraft manufacturers, instrument makers, U. S. Navy yards, machine shops, and equipment manufacturers are rapidly finding this new spring coiler to be an essential piece of equipment for their plants since it saves time and increases production.

★ ★ ★

The coiler is a semi-automatic machine that winds both left-hand and right-hand compression, extension and torsion springs. Among its characteristics is the short set-up time which is only a few minutes. An operator can ordinarily finish between 25 and 35 small lot orders in one day, and springs can be wound from spring steel, music wire, stainless steel, phosphor bronze, nickel, or any other spring material. The coiler is especially useful for winding small quantities of springs up to about 500, and for making experimental or sample springs quickly, easily and accurately.

★ ★ ★

The machine comes equipped with an arbor rack, containing 29 arbors made from hardened drill rods in sizes from 1/16 to ½ inch diameters advancing by 64ths. Also included are three coiling points made from hardened tool steel, and

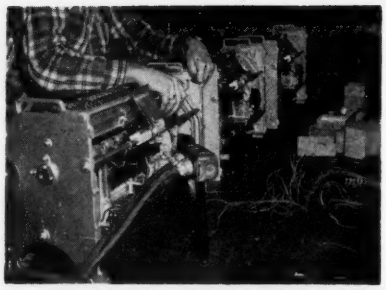


Fig. 3 — Spring being assembled into an automatic toll register.

Fig. 5 — Winding a compression spring for use in a solenoid valve.

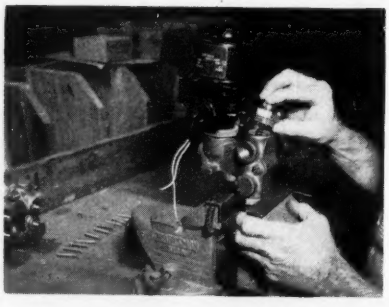


Fig. 7 — Assembling a spring in a solenoid valve.

a wire cutter. No other accessories or tools are required inasmuch as all adjustments are made with thumbscrews and wingnuts.

★ ★ ★

The capacity of the machine is: wire diameters up to 0.063″, outside diameters up to ¾″, overall lengths

(*Please turn to page* 342)

GOSSIP from BRITAIN

Johnson & Phillips, Ltd., the London cable making firm, are to double their plant for making aluminum covered power cables. Experiments have been going on since 1948 with considerable success. It has taken some time too to break down user-prejudice and to convince them that aluminum made a good sheathing; this has been helped by the soaring cost of lead and other commodities that have raised cable prices between 25% and 50% this year. Consequently, the electrical trade is now clamouring for the new aluminum product. The managing director, Mr. William Glass, who started life as a shipyard apprentice, has doubled their orders as compared with a year ago.

★ ★ ★

American wire men may glean some crumbs of consolation in their own troubles by comparing how prices in Britain have increased over the years. For instance, pig lead, which cost fivepence a pound in 1938 rose to thirteen pence in 1945 and to thirtysix pence in 1950. Tin went from £194 a ton in 1938 to £300 in 1945, £744 in 1950, and is now over £1,700. Rubber advanced from sevenpence a pound in 1938 to thirtythree pence in 1950, and prices all round are still rising. Expressed in dollars, £1 = $3.80 and one penny a fraction under 1.06 cents.

★ ★ ★

Wages in all branches have taken steep rises too, but despite these drawbacks, the wire trade as a whole is not doing too badly if balance sheets may be taken as an indication of prosperity. Despite a profits tax of 30%, almost every concern has maintained dividends and in most cases increased them quite considerably. This is surprising and provocative to a socialistic economy.

★ ★ ★

The head of the new nationalised steel board, The British Iron & Steel Corporation, Mr. Steven Hardie, in his inaugural speech on "take-over day", February 14th, stated that firms are to carry on as they are. They will keep their own names and sales organisations. They will even compete with one another. The state board, however, will control prices and will "approve directors and special senior executives". Behave or beware!

★ ★ ★

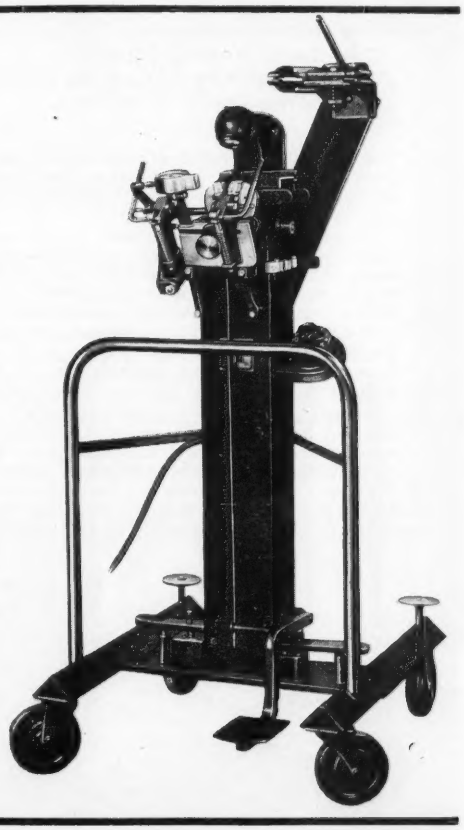
Overseas buyers, it will be seen, will not know whether they are dealing with the state or private industry. The first action was to announce increased steel prices, whilst

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REGISTERED

MODELS J-3-C and J-4-S AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding high and low carbon STEEL, and STEEL ALLOY wire, ranging in size from .020" to 1.60" diameter. All operations on these units, which include the clamping of the wire being welded, contacting the welding switch, and upsetting the weld, are made by a single downward stroke of the foot pedal. Welders for high carbon steel wire are equipped with the exclusive MICRO-WELD Dial indicating annealing device to facilitate the annealing operation on high carbon wire.

Standard equipment with these units include annealing dies, filing vise, light extension cord, and mounted on a 4-wheel truck. Special units can be furnished for crane mounting.



MICRO PRODUCTS CO.,

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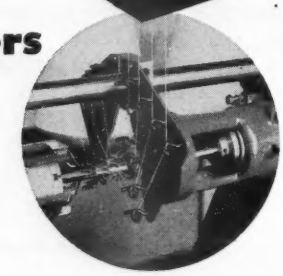
INCREASE YOUR WEATHERPROOF WIRE PRODUCTION...

10-15 times with Fidelity SINFRA wire and cable knitters

Fidelity Sinfra Knitter and Haul-off Reel Stand



Enlarged view of Knitting Head

- Less Yarn Cost
- 15 Times Productive Output
- 600% Greater Labor Productivity
- Less Floor Space
- Lower Maintenance
- Lower Power Requirements
- Complete Automatic Control
- Minimum Noise
- Easier Working Conditions
- Accepted by ASA, AAR, UL, CSA
- Lower Capital Investment

The production of *one* FIDELITY SINFRA wire covering machine is equivalent to the capacity of 15 triple deck braiders! This impressive production achievement is made possible by the reliable and extremely high speed Fidelity Knitting Head, using stationary, large yarn cones.

The SINFRA Knitter is built to the precision standards long associated with Fidelity and is equipped with automatic electric stop motions, controlling both the wire and yarn supply. As the wire enters the SINFRA Knitter it is straightened by a unique straightening device before being passed through a series of 3 knitting heads.

SINFRA Knit is widely acclaimed as the most modern method of covering wire. Wire covered by SINFRA Knit is accepted by the American Standards Association, Association of American Railroads, Underwriters' Laboratories, Inc. and the Canadian Standards Association.

SINFRA Knitter is designed to permit horizontal operation at normal working level. No longer need your operators crawl or stretch to service wire covering equipment and noise level is reduced to a pleasing hum. Top companies have found their answer to production in SINFRA Knitters. Why not write for complete information on this development to lower your production costs and increase your productive capacity.

Write today for literature on this time and money saver.

Manufacturers of intricate precision machinery since 1911.

FIDELITY MACHINE COMPANY INC.

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the appropriate minister in the House of Commons recently stated that it is expected that output will decrease in the industry. This would be in line with what has happened in other nationalised industries—coal, transport, railways, etc. As the steel industry has been increasing production year upon year, it would seem that the socialists are "playing safe".

★ ★ ★

To illustrate how the insidious cancer of nationalisation permeates through the whole wire trade structure, take the case of the Lancashire Steel Corporation, which is typical of many others. The subsidiaries of the corporation are Rylands Bros., Ltd., Warrington, (wire, nails, fencings, barbed-wire, etc.), The Whitecross Co., Ltd., Warrington, (wire ropes), Wm. Robertson & Co. Ltd., Warrington, (wire, extrusion and other manufactures) and the Penfold Fencing Co. of Watford (chain-link fencing).

★ ★ ★

Visiting London recently, after a tour of Canada, was British-born Mr. Barcroft, works manager of Metallogen S.A. of Milano, Italy. Mr. Barcroft has developed for his firm a new wire-drawing machine with unique features and is now arranging manufacturing agencies in the principal countries. It is interesting to learn that he has arranged for Felton & Guilleaume of Cologne, Germany, to manufacture twenty of these machines for use in their own works.

★ ★ ★

The Institute of Metals, 4, Grosvenor Gardens, London, S.W.1., have published a new series of technical books as follows: "Friction in Wire Drawing" by H. H. Baron, M.Sc., and Professor F. C. Thompson, D. Met., M.Sc. (48pp); "Wire Drawing Technique & Equipment" by F. T. Cleaver and H. J. Miller, M.Sc., F.I.M. (26pp); "Cold Rolling of Non-Ferrous Metals in Steel and Strip" by C. E. Davis, M. I. Mech. E. (36 pp); "Lubricants for the Cold Working of Non-Ferrous Metals", by S. F. Chisholm (18pp). The last is almost exclusively concerned with wire.

★ ★ ★

The Amalgamated Society of Wire Drawers and Kindred Workers is the oldest trade union in Britain.

For over a hundred years there had been no strike in the industry over pay problems. The employers and the union, by accommodation, always managed to agree. Times are changing, however, and wire manufacturers have been subjected to a series of petty strikes in mill after mill. The cause is not any disagreement between employer and worker, but between union and union. The huge Transport and General Workers Union have infiltrated their members into the wire mills and are attempting to induce the small union's members to join their larger one. This internal union strife has caused much inconvenience to all concerned.

Government Wire Production Information

Report on Electronic Equipment Construction

"Electronic Equipment Construction—New Objectives, New Techniques and New Components" is the title of a 300-page illustrated report now available to the public from the Office of Technical Services of the U. S. Department of Commerce.

★ ★ ★

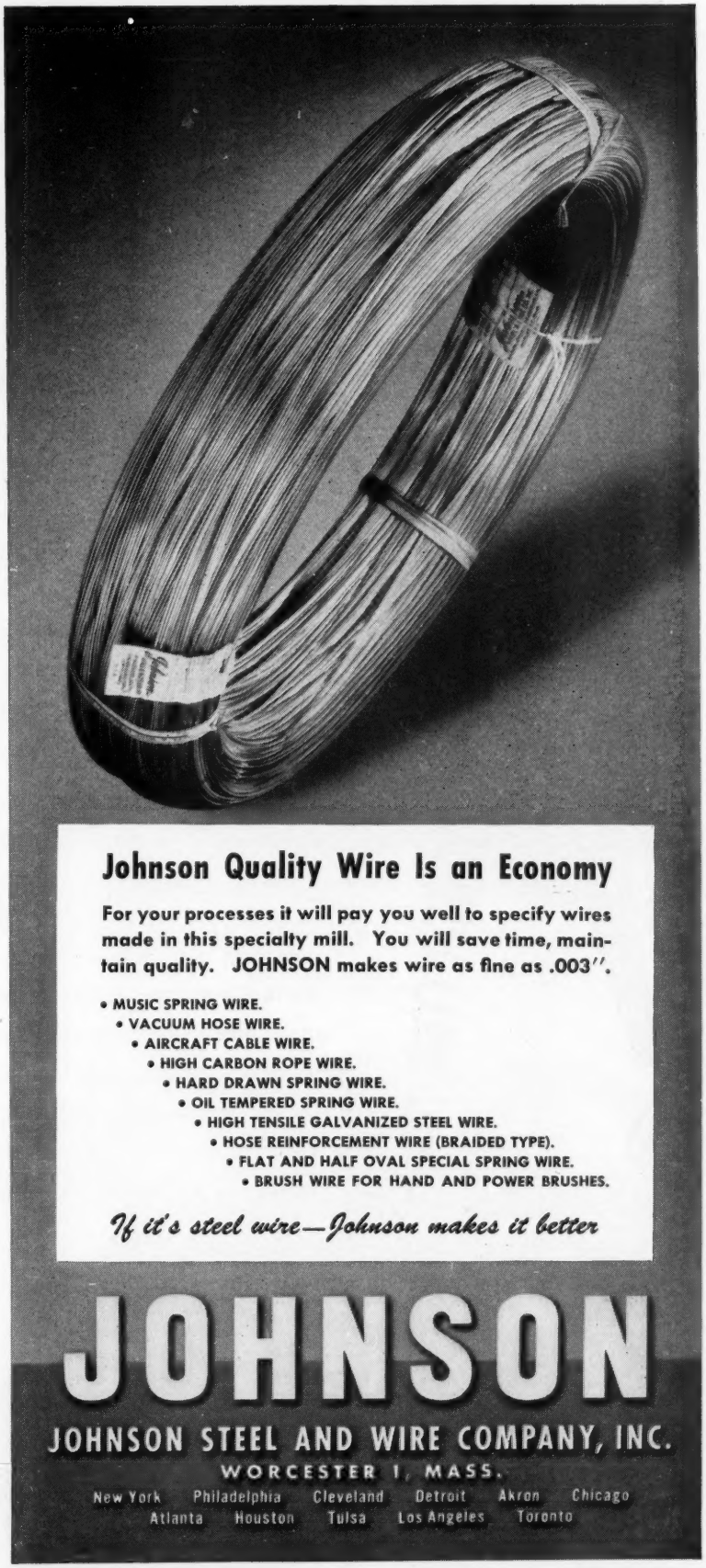
The report, prepared by Stanford Research Institute under contract to the Office of Naval Research, originally was intended simply as an investigation of the means for minimizing maintenance requirements of military electronic equipment. Interest in and demand for information on progress in the entire electronics field was so great however that the study was expanded to its present scope. The necessary survey was conducted and the report compiled by Stanford Research Institute members M. B. Adams, C. Brunetti, J. W. Dawson, F. J. Kamphoefner, J. D. Noe and H. M. Zeidler.

★ ★ ★

The study consists of three parts: A description and evaluation of new components; a discussion of new construction techniques; and a survey of research at sixty-two of the nation's leading electronics development firms and laboratories.

★ ★ ★

Components covered in detail include fixed and variable resistors, fixed and variable capacitors, high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For your processes it will pay you well to specify wires made in this specialty mill. You will save time, maintain quality. JOHNSON makes wire as fine as .003".
• MUSIC SPRING WIRE.
• VACUUM HOSE WIRE.
• AIRCRAFT CABLE WIRE.
• HIGH CARBON ROPE WIRE.
• HARD DRAWN SPRING WIRE.
• OIL TEMPERED SPRING WIRE.
• HIGH TENSILE GALVANIZED STEEL WIRE.
• HOSE REINFORCEMENT WIRE (BRAIDED TYPE).
• FLAT AND HALF OVAL SPECIAL SPRING WIRE.
• BRUSH WIRE FOR HAND AND POWER BRUSHES.
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Atlanta Houston Tulsa Los Angeles Toronto

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UNIFORMITY

KEYSTONE MUSIC Spring Wire

The uniformity of Keystone Music Spring Wire simplifies production problems in the manufacture of intricate springs and parts . . . assures end products of the highest quality.

The structural soundness and uniformity of this quality wire is attained by careful selection of raw materials, slow and meticulous processing and constant examination throughout its manufacture. Rigid final inspections include coiling, torsion and bend tests assuring the right quality to meet your exacting requirements.

If your products require any type of "special" steel wire, please consult us.

frequency inductors and transformers, multiple-components units, vacuum tubes, crystals and transistors, frequency-control and transducer devices, power and audio transformers, relays, indicating instruments, connectors, tube sockets, batteries, motors and servomechanisms, insulating materials, switches and hermetic seals.

★ ★ ★

New construction techniques receiving special attention include printed circuits and conductor patterns; mechanized construction; unitized construction; hermetic sealing methods; cast resin embedment; and heat removal techniques.

★ ★ ★

Of particular interest is a special section in which the current research and development needs of the electronic field are summarized by the authors under these principal headings: Reliability; heat and high temperature resistance; better packaging; miniaturization; and improved manufacturing and mechanization techniques.

★ ★ ★

Special appendices include tables on the properties and characteristics of resistors, capacitors, liquid dielectrics, embedment compounds and printed circuits; and lists of manufacturers of printed-circuit materials, hermetic sealing compounds and casting resins. Bibliographies cover printed circuits, hermetic sealing, cast resin embedment and heat transfer.

★ ★ ★

PB 101 745, Electronic Equipment Construction—New Objectives, New Techniques, New Components, sells for $7 per copy. Orders should be addressed to the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Enclose check or money order payable to the Treasurer of the United States.

Send in

Your Order Now

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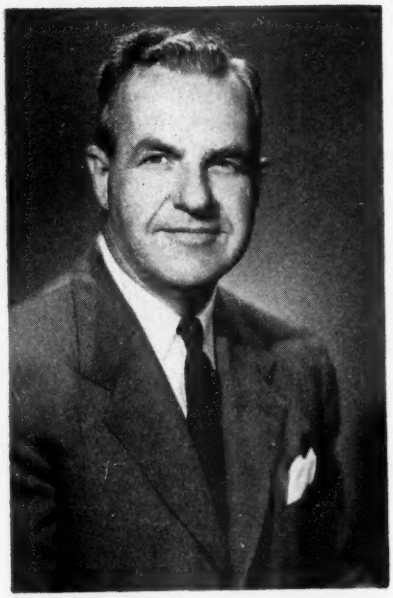
1951 Wire Buyers Guide

Outstanding Personalities of the Wire Industry



F. R. Davis, Director of Purchases, Continental Steel Corporation, Kokomo, Indiana.

Davis and Pickett to Handle Purchasing for Continental

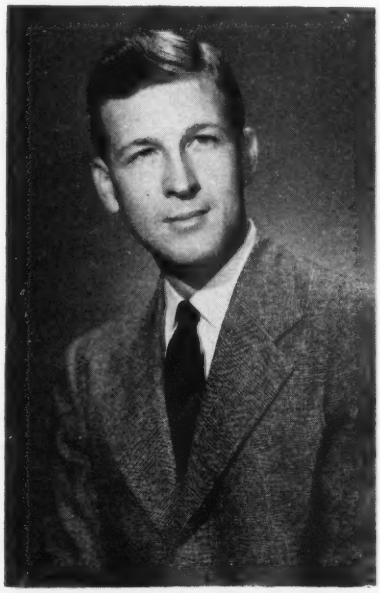
G. L. Rathel, Vice President in Charge of Purchases for **Continental Steel Corporation,** Kokomo, Indiana, is retiring at the end of this year after 37 years of service with the corporation and its predecessor companies, it was announced recently by Ralph K. Clifford, company president.

★ ★ ★

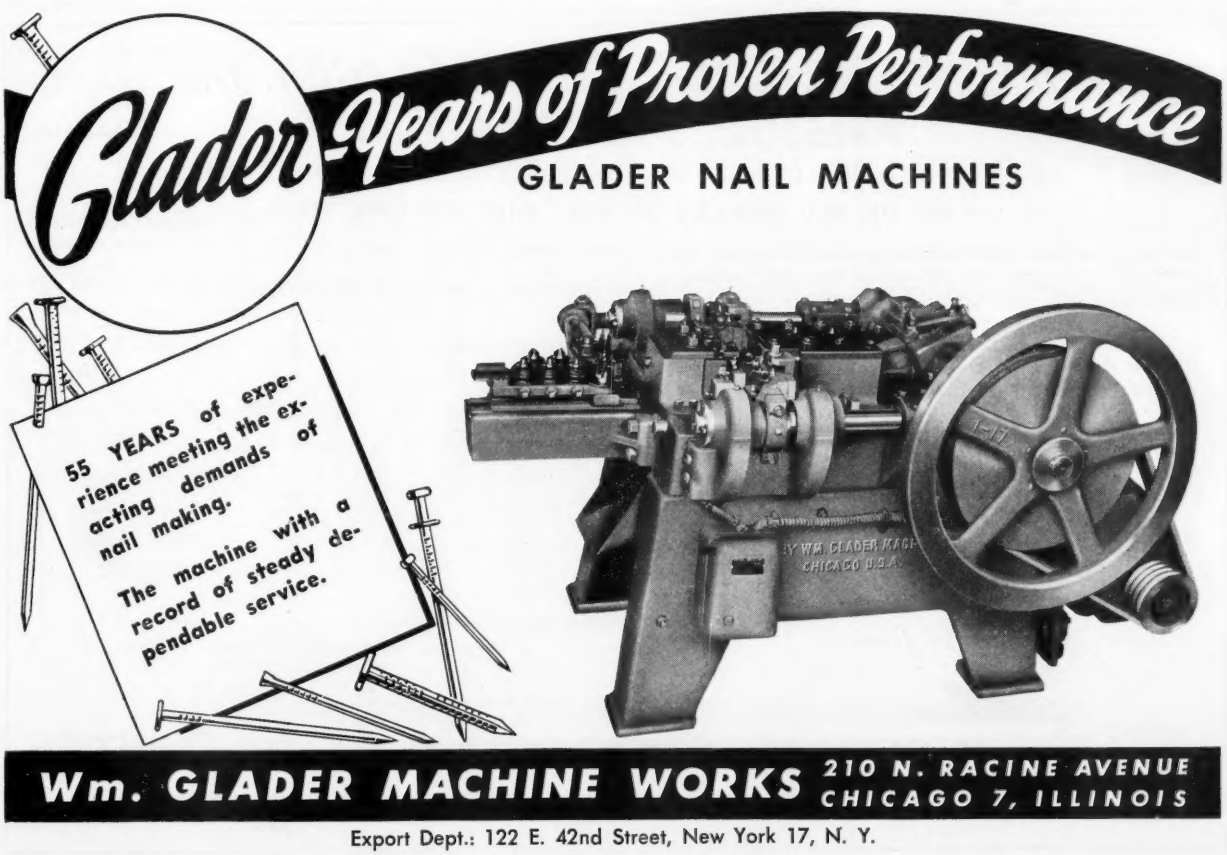
Announcement also was made by Mr. Clifford that Mr. Rathel will be succeeded by his present assistant, **F. R. Davis,** who becomes Director of Purchases. **D. J. Pickett,** formerly assistant credit manager has been made assistant to Mr. Davis.

★ ★ ★

Mr. Davis has been connected with Continental and its former subsidiary company, Chapman Price Steel Company, Indianapolis, for 25 years, entering the employ of the



D. J. Pickett, Assistant Director of Purchases, Continental Steel Corp., Kokomo, Indiana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GLADER NAIL MACHINES
55 YEARS of experience meeting the exacting demands of nail making.
The machine with a record of steady dependable service.
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Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

latter company in 1925 as storekeeper. He moved to Kokomo in 1931 as assistant purchasing agent for Continental, a position he has held until the present time.

★ ★ ★

Mr. Pickett's employment with the company began in 1940 following his graduation from DePauw University. He entered the Navy in December, 1941, serving in the Pacific area as a lieutenant until his discharge in 1945 when he resumed employment with Continental as assistant credit manager.

★ ★ ★

Altas Mineral Products' Staff Changes

Atlas Mineral Products Company announces that **Earl Erich**, formerly of the Technical Service Department, has been made Product Director for Linings and Coatings.

★ ★ ★

The company has also added **George Kanelis,** a chemical engineer, to its Engineering Department. Mr. Kanelis is a graduate of the University of Syracuse.

★ ★ ★

C. F. & I. Changes Announced

Personnel changes at the CF&I Pueblo plant, effective March first, were announced to keep in step with current expansion programs of the Corporation.

★ ★ ★

Rudolph Smith is named Works Manager of the Pueblo plant, a position which has not been filled since February 1949 when Jay J. Martin, then Works Manager, was elected Vice President in Charge of Operations.

★ ★ ★

Mr. Smith, a graduate of the University of Nebraska Engineering School, came to CF&I in July 1927 and served in several engineering positions. He became superintendent of the open hearth, the largest operating department in the plant, in 1946, and during his service as superintendent the all-time steel production record of the Pueblo plant was established when 1,300,000 ingot tons of steel were produced in the year 1950.

★ ★ ★

Name Project Manager for New Fiberglas Plant

Appointment of **George S. McElroy** as project manager for **Owens-Corning Fiberglas Corporation's** new Fiberglas yarn plant in Anderson, South Carolina, has been announced by **John H. Thomas,** vice president and general manager of the company's Textile Products Division.

★ ★ ★

Mr. McElroy is directing the building and equipping of Owens-Corning's new Anderson plant, as well as supervising training of future key plant personnel. The training is currently underway in the company's Newark, O., plant.

★ ★ ★

Since joining Owens-Corning in January, 1946, Mr. McElroy has done extensive technical research work to develop and refine processes for producing Fiberglas yarns. Prior to his new appointment, he had spent two years in the company's Fiber Forming Laboratory in Newark and a like period in the Textile Processing Laboratory in

Use the Reel that is Made With the

* Trade Mark Reg. ***"PRESSURE PAD" FASTENER**** ** Patent Applied for.

MOST IMPORTANT ADVANCE IN REEL CONSTRUCTION IN MANY YEARS

USED ON ALL HOWSAM MAGNET WIRE SHIPPING REELS.

Introduced in 1946, HOWSAM REELS of this construction have won wide approval throughout the wire industry.

ASSEMBLY OF "PRESSURE PAD" FASTENER REELS REQUIRE ONLY ONE TOOL AND IS A ONE-MAN JOB. HOLD SO SECURELY, TIGHTENING IS REDUCED AS MUCH AS 80%.

BESIDES WHICH, THE "PRESSURE PADS" SEAL THE BOLT HOLES AND EXCLUDE MOISTURE EFFECTIVELY.

MAINTENANCE COSTS GREATLY REDUCED

PACKAGE APPEARANCE IMPROVED

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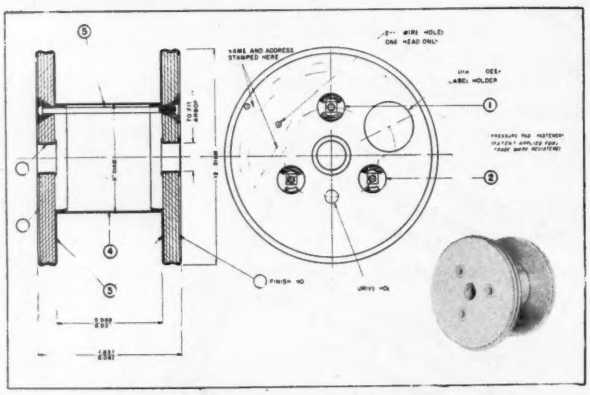

Line Drawing and Picture of The Howsam 12" Reel.

PHONE: 2-3043

HOWSAM SPOOL COMPANY

AURORA, ILLINOIS

Ashton, R. I. The Anderson plant is expected to be completed by mid-1951.

★ ★ ★

National Electric Products Moving Linton to Washington

T. M. Linton has been chosen as district manager of the Washington, D. C., territory for **National Electric Products Corporation**, Pittsburgh, Pa. In making this announcement, vice president R. C. Bennett, Jr., stated that Mr. Linton is taking over the duties of J. S. Cowan who recently was made manager of government business for the electrical roughing-in products firm.

★ ★ ★

A native of the District of Columbia, Mr. Linton was graduated by George Washington University. He joined National Electric in 1937. He is a member of the Washington Building Congress, the American Legion, the Washington Board of Trade and the University Club. He will make his headquarters in the Company's Washington sales office in the Investment Building.

★ ★ ★

W. A. Morton to Head Loftus Engineering Co.

The Board of Directors of the **Loftus Engineering Corp.** recently announced the election of **W. A. Morton** as president to succeed the late Fred H. Loftus.

W. A. Morton, President of Loftus Engineering Co.

★ ★ ★

Mr. Morton joined the Loftus Corporation one and a half years ago having previously served as President of the Amsler-Morton Company of Pittsburgh for some twenty years during which time he was the patentee of various types of heavy duty furnaces widely used in the steel industry.

★ ★ ★

No other changes in official personnel are contemplated but further expansion of the engineering staff is now under way to take care of the Corporation's increasing activities both at home and in foreign countries. Contracts now in hand exceed twelve million dollars.

★ ★ ★

Made Product Engineer

The Atlantic Steel Company, Atlanta, Georgia, announces the appointment of **Paul A. Duke** to the post of Product Engineer.

★ ★ ★

DAVIS EQUIPMENT . . .

FOR ELECTRIC WIRE MANUFACTURE

AUTOMATIC SPARK TESTER — For the accurate location of dielectric faults in insulating wire coating. Used in continuous line with plastic extruders or curing equipment. Voltage range of 3,000 to 16,000 volts.

CAPSTAN — Motor-driven, variable speed, for use with high-speed plastic extruders. Standard speeds of 100 to 1500 r.p.m. Higher speed gearing can be provided.

PAY-OFF STAND — Controls tension at wire and brakes automatically and smoothly.

TAKE-UP STAND — Automatically stops when dielectric faults are indicated by the SPARKER. Designed particularly for use with high-speed plastic covering machines.

AUTOMATIC RE-SPOOLER—Layer winds parallel cords. Has motor driven traverse with adjusting stops. Good not only for insulated wire, but for bare wire.

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Design for continuous, fast, precision operation.

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THE R. L. DAVIS ELECTRIC CO., INC. • WALLINGFORD, CONN.

SPARK TESTERS • SPOOLERS • TAKE-UPS • CAPSTANS

R. E. Carter Joins Furnace Engineers, Inc.

Roy E. Carter, formerly chief engineer of Sharon Steel Corporation, Sharon, Pa., has been named vice president, in charge of engineering, for **Furnace Engineers, Inc.,** Pittsburgh.

★ ★ ★

The Pittsburgh concern builds open hearth furnaces, soaking pits, and reheating and normalizing furnaces for all kinds of steel products.

★ ★ ★

A. L. Whiton Made President Of Wire Bound Box Manufacturers Ass'n

A. L. Whiton of Chicago was elected president of the Wirebound Box Manufacturers Association at its annual meeting in New Orleans recently. He succeeds Norris W. Embry, also of Chicago, who was named vice president.

★ ★ ★

Two new directors also were elected. They are Kenneth H. Leash of Portland, Ore., and W. J. Pierpont of Savannah, Ga.

★ ★ ★

A. C. Adams Advanced by Cleveland Crane

The Cleveland Crane & Engineering Company, Wickliffe, Ohio, announce the appointment of **Ancel C. Adams** as General Plant Superintendent. Mr. Adams has been with the company for twenty-eight years, during which time he has served as Manager of the Shipping, Receiving, and Stores Department; Traffic Manager; and Assistant Plant Superintendent.

★ ★ ★

The company manufactures heavy overhead traveling Cranes, Cleveland Tramrail Overhead Materials Handling Equipment, and Steelweld Presses and Shears.

★ ★ ★

Johns-Manville Elevates J. A. O'Brien

Appointment of **J. A. O'Brien,** General Manager of the Industrial Products Division, as one of three new Vice Presidents of **Johns-Manville Corporation,** has been announced by Lewis H. Brown, Chairman of the Board and Chief Executive Officer of the company.

★ ★ ★

Witherspoon Made Assistant To General Superintendent at Donora

J. C. Witherspoon, named assistant to general superintendent of the Donora Steel & Wire Works, of the American Steel & Wire Co.

★ ★ ★

R. L. Davis

Ralph L. Davis, president of the **R. L. Davis Electric Company** of Wallingford, Connecticut, passed away on March 2nd, 1951, after an extended illness. The business will be carried on as heretofore with Mrs. M. Josephine Davis as president.

★ ★ ★

Mr. Davis was best known in the wire industry for an electric sparker developed by him, that is used widely in the electric wire and cable industry for testing wire insulating coatings for dielectric faults. He had also developed a number of accessory items, such as capstans, take-ups and pay-out equipment.

★ ★ ★

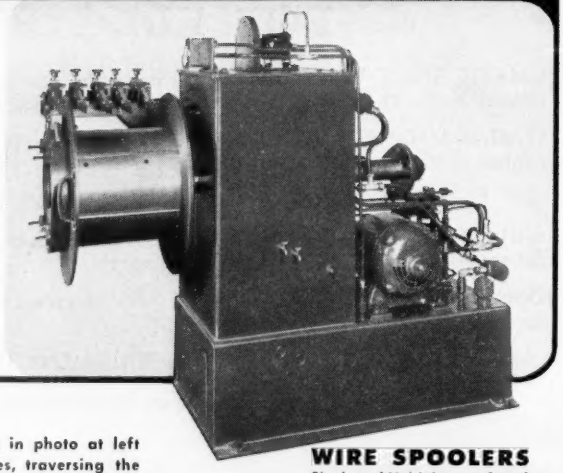
Our industry suffers a definite loss in the death of Mr. Davis.

★ ★ ★

COIL 5 STRANDS IN 1 OPERATION

SECO TRAVERSE REEL SPEEDS UP PRODUCTION

This new SECO Traverse Reel winds five separate coils of flat wire or narrow strip *at the same time.* Coils are oscillated-wound, permitting much longer lengths than conventional ribbon-wound coils. Smooth, powerful hydraulic operation gives coiling speeds as high as desired, accurately controlled from zero to top running speed.



Method of coiling is shown in photo at left The complete block oscillates, traversing the wire into five 3" wide coils. Traverse and tension control are extremely accurate. 1/8" to 1/2" wide flat wire can be wound. Block has 16" inside diameter and 24" outside diameter.

Call or Write for Information and Complete Data — No Obligation

WIRE SPOOLERS
Single and Multiple type. Speeds up to 4,000 feet per minute.

SECO

STEEL EQUIPMENT CO. 2890 East 83rd St., Cleveland 4, Ohio

Charles E. Gray

Charles E. Gray, works manager of the Rome Manufacturing Company Division of Revere Copper & Brass, Inc., at Rome, N. Y., died recently following an operation at the Faulkner General Hospital here.

★ ★ ★

Mr. Gray was 65 years old and had been works manager of the Division since 1935. He was formerly assistant works manager, having joined Revere Copper & Brass, Inc., in 1929. He was born in Watertown, N. Y.

★ ★ ★

Harry W. Schuetz

Harry W. Schuetz, vice president of Pittsburgh Screw & Bolt Corporation, died on March first. He was 66 years of age, and a resident of Glen Osborne, Pa.

★ ★ ★

Mr. Schuetz was well known in the steel industry, having been associated with Pittsburgh, Screw & Bolt Corporation since 1928 as assistant to the president and later as vice president in charge of their Colona division.

★ ★ ★

Worth Steel Renamed Claymont Steel Corporation

On March 5, 1951, **The Colorado Fuel and Iron Corporation** formally completed acquisition of the **Worth Steel Company** at Claymont, Delaware. This plant will now be operated by a wholly-owned subsidiary of C. F. & I. to be known as the Claymont Steel Corporation. Officers of the new Corporation are: **Charles Allen, Jr.,** Chairman of the Board, **C. W. Meyers,** President, **A. F. Franz,** Executive Vice President, **Franklin Berwin,** Vice President and Secretary, **A. C. Bekaert,** Vice President of Finance, **F. S. Jones,** Vice President of Sales, **H. C. Crout,** Treasurer, **Earl D. Page,** Controller and **J. J. Martin** has been made Vice President in Charge of Operations and the Manager of Plant Operations will be **W. P. Worth,** with **R. M. Worth** as General Manager Sales, and **E. H. Worth, Jr.** as Assistant Treasurer and Assistant Secretary.

Paulsen-Webber Opens Office in South

The opening of a Gulf Coast Office in the International Trade Mart Building in New Orleans is announced by the **Paulsen-Webber Cordage Corporation,** Manufacturand Distributors of Wire Rope, Fiber Rope, Twine, Chain, Canvas and Allied Fittings.

★ ★ ★

The Office will set up and serve Paulsen-Webber Marine, Industrial and Agricultural dealers in the Gulf Coast States from Texas to Florida and will assist in the trans-shipment of materials in this area.

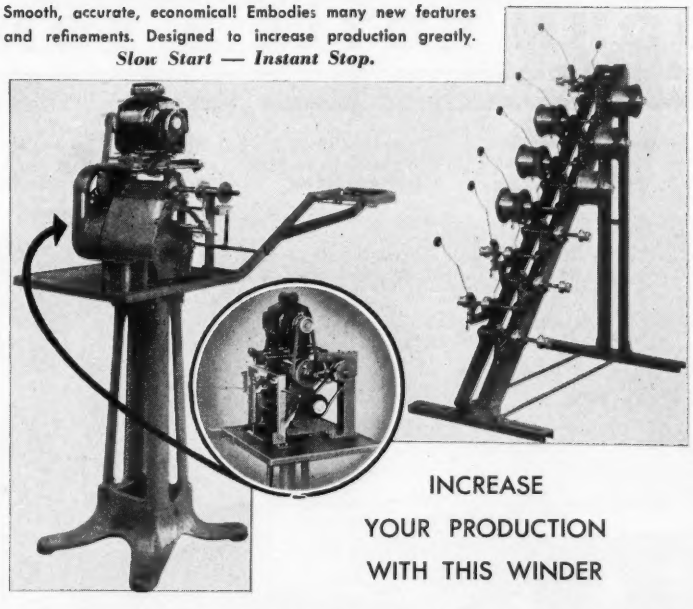
Harry Brownlee, for many years manager of the Company's Order Department in the Home Office in New York, will be the Branch Manager. New Orleans is the eighth branch to be opened by Paulsen-Webber—other locations are Boston, New York, Philadelphia, Baltimore, Norfolk, Omaha, Nashville.

Patronizing Our Advertisers

These are the progressive concerns who stand behind their products and have reputations worth sustaining and you depend upon them.

STANDARD UNI-DRIVE WIRE WINDER

Smooth, accurate, economical! Embodies many new features and refinements. Designed to increase production greatly.
Slow Start — Instant Stop.



INCREASE
YOUR PRODUCTION
WITH THIS WINDER

PAYOFF
Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

Some outstanding features are: elimination of main drive belts; traverse adjustable to various distances between spool heads—from 1⅝" to 5½"—without changing cam; winds up to 12 ends of wire on each spool; winds ends evenly in flat ribbon in perfect alignment with spool heads; each strand of wire lays parallel to the next with no under-winding, over-winding, tight or loose spaces; starts gradually; driven by ¼ H. P. A. C. 110 volt, 60 cycle, single phase motor.

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PAWTUCKET, R.I., 1064-1080 Main St.
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the ROYLE SPIROD* EXTRUDER

A completely new and different concept of electrically heated extruder designed for plastics materials. . . . Higher operating temperatures. . . . Lower operating costs. . . . Radiant heated. . . . Zoned as required throughout cylinder and head. . . . Even and controlled cooling. Royle Spirod Extruders have been field-tested and their stamina proved. Check these features that assure trouble-free operation —positive results.

- Heavy steel members without flanges
- Spirally installed rod type heating elements provide faster and more even distribution of heat
- Radiant heat provides steadier temperatures
- Complete insulation reduces heat loss with substantial power savings
- High watt capacity heating elements provide faster heat at lower cost
- Long life heating elements provide high and sustained operating temperatures
- Separate heating zones controlled by proportioning instruments
- Simple installation should replacements become necessary

*Patent Applied For

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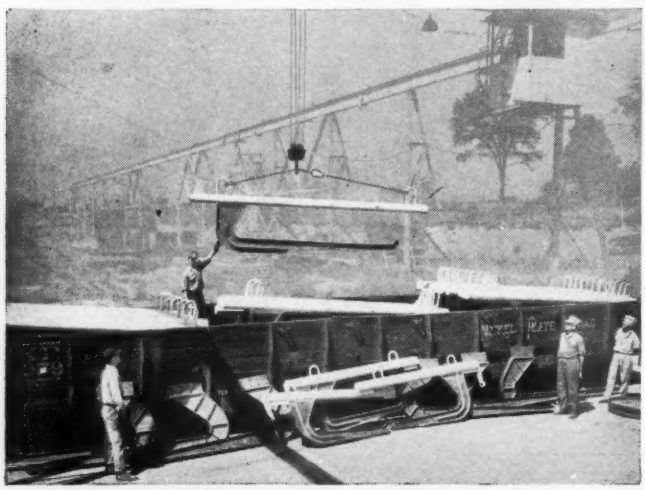

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WELDCO HAIRPIN HOOKS SPEED UP YOUR PICKLING AND MATERIAL HANDLING OPERATIONS

● Here's another carload of Weldco hairpin hooks, ready for shipment to one of the country's largest steel plants. These pickling hooks are lightweight but tough . . . designed to handle loads as heavy as 3,000 to 5,000 pounds, easily and safely. Weldco hairpin hooks withstand hot pickling acids, too; in fact, they're more corrosion-resistant—more durable—than many heavier hooks.

Weldco pickling hooks are made of Monel, and can be furnished in various other alloys. Put these sturdy, lightweight hooks to work in your plant—then watch your pickling and material handling costs go down.

OTHER WELDCO PICKLING PRODUCTS
Include Pickling Crates, Baskets, Chains, Jets, Scrubbers, and Mechanical Picklers
WRITE FOR FREE CATALOGS

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY

3700 OAKWOOD AVENUE . . . . YOUNGSTOWN 9, OHIO

A Review of Recent Wire Patents

No. 2,540,164, HIGH FREQUENCY COAXIAL CABLE HAVING A DOUBLE LAYER INNER CONDUCTOR, patented February 6, 1951 by John Norman Dean, Brasted, and Esmond Wassell Smity, Beechcroft, Chislehurst, England, assignors to The Telegraph Construction and Maintenance Company Limited, London, England.

In a high frequency coaxial cable, the combination of an non-conductive supporting core; a conductor surrounding said core and comprising a first conductive layer formed by conductive metal tapes arranged in edge-to-edge contact and applied to the core with a relatively long lay, and a second conductive layer consisting of a singe metal tape applied longitudinally over and enwrapping the tapes of the first conductive layer with the edges of the single metal tape being parallel to the axis of the cable; a binder of dielectric material helically applied over the second conductive layer tape; and an outer insulating envelope.

★ ★ ★

No. 2,540,314, PROCESS AND COMPOSITIONS FOR APPLYING PHOSPHATE COATINGS, patented Feb. 6, 1951 by Paul Amundsen, Detroit, Mich., assignor, by mesne assignments, to Parker Rust Proof Company, Detroit, Mich., a corporation of Michigan.

★ ★ ★

Ferrous metal surfaces are coated by immersion in a solution consisting essentially of zinc dihydrogen phosphate, phosphoric acid, zinc chloride, water, and a soluble chloride other than zinc, the chloride in excess of the chloride equivalent to the chloride of the zinc chloride being present in solution in at least 1 gm. of chloride per 10 gms. of zinc dihydrogen phosphate, the solution having a free acid to total acid ratio of between 1:3.5 and 1:20, a pH of between 1.5 and 4.0, a zinc concentration of at least .001 mol. per liter and a phosphate concentration of at least .003 mol. per liter.

★ ★ ★

No. 2,540,398, APPARATUS FOR DETERMINING THE NUMBER OF TURNS IN ELECTRICAL COILS, patented February 6, 1951 by Stanley J. Lesniak, Chicago, Ill.

Coils, such as rewound magnet coils, are said to be quickly and accurately tested, as to number of turns for this apparatus.

★ ★ ★

No. 2,540,495, TIE MEANS FOR CONNECTING MEMBERS TOGETHER AND TO A SUPPORT, patented February 6, 1951, by Wendell L. Sorenson, Great Neck, N. Y.

This invention embodies a clip for attaching wire springs to make up a spring unit for bed springs, etc.

★ ★ ★

No. 2,540,779, RESILIENT SPRING WIRE SUPPORT, patented February 6, 1951 by Perley C. Forbes, Mishawaka, Inc., assignor to United States Rubber Company, New York, N. Y., a corporation of New Jersey

U-shaped turns of wire are hooked over a tubular support with reverse turns disposed between the U-shaped turns.

★ ★ ★

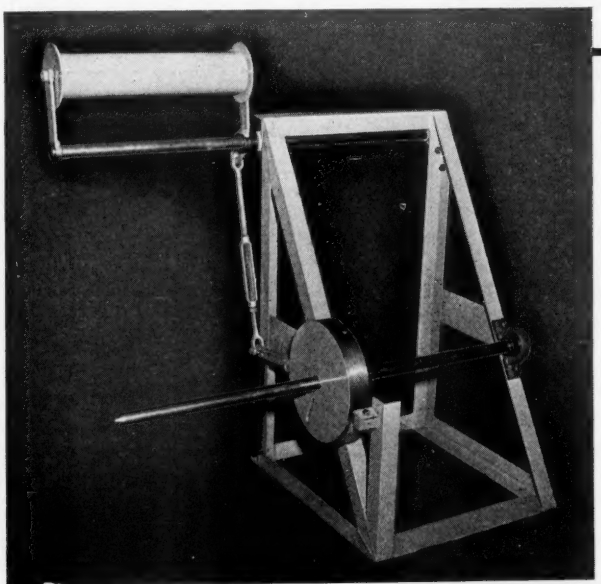
No. 2,540,840, STRAND GUIDING APPARATUS, patented February 6, 1951 by Gordon C. Spillman, Roselle, N. J. and Nicholas Zuck, Brooklyn, N. Y., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Wire strand-guiding units are provided for a wire stranding machine.

★ ★ ★

No. 2,541,232, WIRE COILING AND SIZING MACHINE, patented February 13, 1951 by John O. Forster, Long Island City, N. Y., assignor, by mesne assignments, to Heli-Coil Corporation, Long Island City, N. Y., a corporation of Delaware.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.



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Federal Manufacturing Co.
SPECIAL WIRE MACHINERY
236-240 Hall Avenue, Wallingford, Conn.

The coiled wire is intermittently notched and severed at the notches.

★ ★ ★

No. 2,541,388, BARBED WIRE, patented February 13, 1951 by Harold Swanson, Brownhelm Township, Lorain County, Ohio.

A single-strand wire is provided with barbs welded tangentially to the wire, the barbs having bias cut ends, one bias cut end forming points for the barbed wire, the other bias cut end welded to the main wire, and the barbs being off-set enough from the center of the main wire to form tangents between the outer surfaces of the main wire and one edge of the barbs, the barbs spaced at intervals along the main wire.

★ ★ ★

No. 2,541,813, CALORIZING PROCESS, patented February 13, 1951 by Wayne R. Frisch and James W. Roy, Pittsfield, Mass., assignors to General Electric Company, a corporation of New York.

Metal articles are protected from axidation by applying a coating of a suspension of finely-divided aluminum in a fugitive liquid carrier medium comprising a resin which will decompose and evaporate at a temperature below 600° C., the aluminum comprising a major portion by weight of the composition, and firing the coated article at a temperature of at least 600° C. to drive off the suspension medium and alloy the aluminum with the surface metal of the article, the finely-divided aluminum consisting of from 65 to 75 per cent franular aluminum powder and from 25 to 35 per cent flake aluminum.

★ ★ ★

No. 2,542,043, METHOD OF PRODUCING A CORROSION RESISTANT COATING ON STEEL, patented February 20, 1951 by Glenn H. McIntyre, Cleveland Heights, Ohio, and Millard G. Ammon, Nashville, Tenn.

A layer is applied of from about 1/12 to about 1/4 ounce per square foot dry weight of a feldspar-silica-borax containing porcelain enamel sheet steel ground coat which at dry weight of 1 1/4 to 1 3/4 ounces per square foot would fuse to a glassy surface when fired for about 3 to 5 minutes at a temperature of from about 1560° F. to about 1580° F. and the coated article is then fired at from about 5 to 8 minutes at from about 1500° to about 1700° F. to first form iron oxides on the metal surface and then to absorb such oxides into the enamel coat to produce a completely divitrified coating, the coating is said to be characterized by its extreme thinness, high resistance to corrosion and tenacious adherence to the metal article.

★ ★ ★

No. 2,542,116, GUIDE FOR CAN OPENING KEY AND TEAR STRIP, patented February 20, 1951 by Joseph H. Bulger, Los Angeles, Calif.

The device comprises a single sheet of bent wire.

★ ★ ★

No. 2,542,257, WIRE DRAWING MACHINE, patented February 20, 1951 by Weld Morgan and Clarke D. Wesson, Worcester, Mass., assignors to Morgan Construction Company, Worcester, Mass., a corporation of Massachusetts.

A new guide is provided for guiding the wire from each block to the following die, the block being air cooled.

★ ★ ★

No. 2 542,303, WINDING MACHINE, patented February 20, 1951 by James E Bosh, Berwyn, and Peter Alex, Chicago, Ill., assignors to Kellogg Switchboard and Supply Company, Chicago, Ill., a corporation of Illinois.

More specifically, the machine is for inserting insulation material, or separation layers, in layer-wound wire coils. There are 31 claims.

★ ★ ★

No. 2 542,354, SEAT CUSHION SPRING ASSEMBLY, patented February 20, 1951 by Cornelius Eugene Platt, Carthage, Mo.

The wire coils are connected by the use of rings formed of sheet metal and having the form of a U-shaped channel having an outwardly extending walls.

★ ★ ★

No. 2,542,882, WIRE CONTAINER, patented February 20 1951 by Jay C. Shumway, Kansas City, Mo.

This container is adapted to hold and dispense a coil of wire.

★ ★ ★

No. 2,542,920, TRASH BURNER, patented February 20, 1951 by Fred W. Gardner, Des Plaines, Ill.

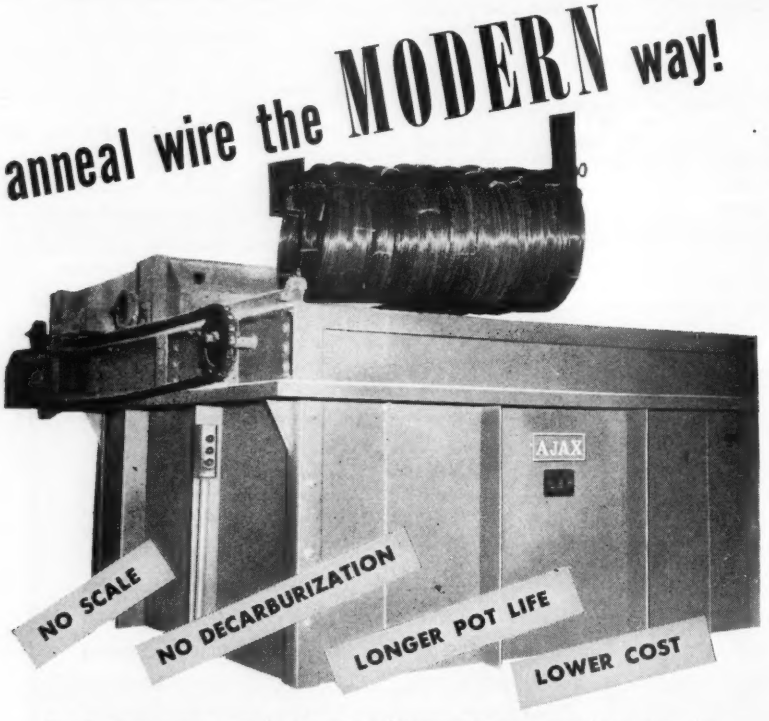
Stiff wire strands from this container which has a hinged top and side wall.

★ ★ ★

No. 2,543,365, METHOD OF TIN COATING FERROUS METAL ARTICLES AND BATH THEREFOR, patented February 27, 1951 by Arch W. Harris, Euclid, Ohio, assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

In this method after the article is immersed in an acidified aqueous solution of a copper salt, thereby causing a layer of copper to be deposited on the article, the copper coated article is immersed in a bath of an aqueous solution of a water-soluble stannous salt and zinc chloride, having a quantity of metallic tin therein and held in the last bath until the copper coating thereof is entirely replaced by tin, the metallic tin in the bath replacing the tin plated out of the bath.

★ ★ ★



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AJAX HULTGREN **ELECTRIC SALT BATH FURNACE**

No. 2,543,370, SPRING COILING AND ASSEMBLING, patented February 27, 1951 by Jonathan Kludt, Overland, and Howard Parks, St. Louis, Mo., assignors to Lincoln Engineering Company, St. Louis, Mo., a corporation of Missouri.

Helical springs are formed and assembled by coiling the end portion of a continuous length of wire into a helical spring with the axis of the spring vertical, relatively moving the spring and a spring-receiving member to position the member with its passage opening upward directly and immediately under the formed spring, and cutting the wire to sever the spring from the remainder of the wire, whereupon the spring drops directly by gravity into the passage.

★ ★ ★

Manual on Quality Control of Materials

A new ASTM Manual on Quality Control of Materials, sponsored by Committee E-11 on Quality Control of Materials, has been issued and takes the place of the widely used ASTM Manual on Presentation of Data.

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The new Manual is organized in three parts:

Part 1 represents a revision of the main section of the former ASTM Manual which it replaces. This section discusses the application of statistical methods, other problems of condensing the information contained in a single set of observations, and presenting essential information in a concise form. Special attention is given to types of data such as would be gathered by individuals or committees and presented to the Society, with emphasis on the variability and the nature of frequency distributions of physical properties of materials.

★ ★ ★

Part 2 represents a revision of Supplement A of the old ASTM Manual which it replaces. In this section is discussed the problem of presenting limits to indicate the uncertainty of the average of a unique sample of observations. In this part is suggested a form of presentation for use when needed in ASTM reports and publications; the restricted conditions under which this form is theoretically applied are given and the meaning of such limits is explained, and a table is given to permit ready calculation of 99 per cent, 95 per cent, and 90 per cent "confidence limits" for various sample sizes. Working rules are presented regarding the number of places to be retained in computation and presentation of average, standard deviations, and confidence limits. In this revision the generally accepted term "confidence limit" is introduced, and constants for computing 95 per cent confidence limits are added.

★ ★ ★

Part 3 presents formulas, tables, and examples useful in applying the control chart method of analysis and presentation of data as mentioned above. This method requires that the data be obtained from several samples or that the data be capable of subdivision into subgroups on the basis of relevant engineering information. The principles of this part are discussed largely in terms of the quality of materials and manufactured products.

★ ★ ★

The ASTM Manual on Quality Control of Materials (STP No. 15-C), 100 pages, in heavy paper cover, can be procured from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at $1.75 per copy.

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16,000 Springs Form Surface Of Rolls On Laundry Pressers

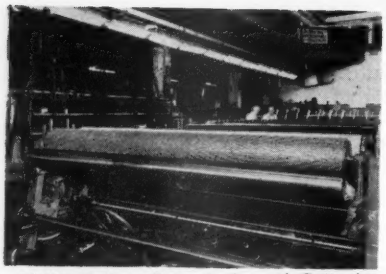
Thousands of small barrel springs made of phosphor bronze wire are establishing an almost phenomenal record of endurance on huge flatwork ironers in scores of commercial laundries.

★ ★ ★

In the largest of these machines, each pressure roll, 120 inches long and 11 inches in diameter, has 16,000 of these springs, each containing six inches of wire—a total of 8,000 feet per roll. When covered with padding, this construction gives a resilient, constantly flexing surface as the rolls turn under heavy pressure at surface speeds up to 85 feet per minute. The springs are attached to brass sheets by a stamping process patented by the American Laundry Machinery Co. of Rochester, N. Y., which manufacturers the ironers, and the sheets are wrapped securely around the rolls.

★ ★ ★

In such an application, the wire



16,000 Springs Form Surface of Rolls in Laundry Pressers.

must resist countless deformations, each of which drives these small springs almost to total flatness. The wire must also withstand constant moisture from the steam chests on each ironer, and must retain its spring characteristics in a working temperature of 300 F.

★ ★ ★

This performance is being maintained with a Riverside phosphor bronze alloy 300, eight numbers hard. Wire is furnished in thicknesses of .057 and .050 inches, and is coiled into springs at the American Laundry Machinery Co. plant.

★ ★ ★

Springs of the same alloy are used also on the relatively flat ironing bucks of shirt and wearing apparel presses, where pressures of approximately 8,000 psi are exerted.

★ ★ ★

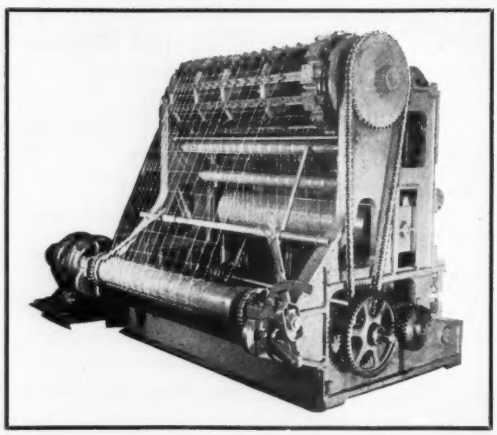
The choice of alloy and the method of providing a uniformly resilient surface have been proved in service, both by the performance of the phosphor bronze springs and the shortcomings of substitute materials tried during World War II. At that time, even cadmium plated springs rusted severely in this application.

★ ★ ★

Long life has been attested in two ways. When one flatwork ironer was disassembled for overhaul after 21 years' service in a commercial laundry, for example, the phosphor bronze springs were found not to need replacement. Moreover, when one lot of springs was allowed to remain in stock for two years, they were found to have taken no set, and to exhibit no trace of age-hardening.

★ ★ ★

INTERLOCKING FENCE LOOMS



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"Airlift" Aids Standard Cable Meet Quota

An "airlift" operation, necessitated by the recent railroad strike, was instituted by **Standard Cable Corporation** of Chickisha, Oklahoma, to rush vitally needed strand, used to manufacture WD-1 infantry wire, from Williamsport, Pa. To compensate for the lost time, the completed strand was flown by C-46 to Chickisha so that quotas could be met.

★ ★ ★

The strand, ordinarily shipped by truck with four or five days needed for delivery, is to be flown until regular schedules are resumed. The C-46 carries 13,000 pounds of strand, equal to one full truck load.

★ ★ ★

Standard Cable is now filling three contracts from the Signal Corps for WD-1 wire, totaling over $12,000,000. Some of the cable is already in use in Korea.

★ ★ ★

A second plant will be opened soon. **The machinery** for it was part of the government industrial reserve stockpile and has been loaned to the corporation for the duration of its government contracts. An additional twenty new stranding machines have been purchased.

★ ★ ★

New Bulletin on Variable Speed Drives Issued by Reeves

An attractive new 12 page bulletin, #G-509, which describes the basic operating principle of the Reeves Variable Speed Drives and contains representative rating tables and dimension drawings, is being offered by the Reeves Pulley Company, Columbus, Indiana. Reeves, manufacturer of more than 300,000 Variable Speed Drives, offers the only complete line of variable speed equipment. Capacities range from ¼ to 87 HP with stepless speed changes within ratios from 2:1 to 16:1. The new bulletin covers, in condensed form, the three basic Reeves units—Variable Speed Transmission, Vari-Speed Motodrive, Vari-Speed Motor Pulley—and a wide variety of manual and automatic controls for use with them. Copies are available upon request.

★ ★ ★

American Iron and Steel Institute
Summaries of Shipments for 130 Companies in 1950

STEEL PRODUCTS	To Date This Year				
	Carbon	Alloy	Stainless	Total	Per cent of Total Shipments
Ingots	743,617	127,803	16,904	888,324	1.2
Blooms, slabs, billets, tube rounds, sheet bars, etc.	* 1,777,696	* 445,731	10,405	* 2,233,832	3.1
Skelp	123,388	-	-	123,388	0.2
Wire rods	799,511	15,518	1,526	816,555	1.1
Wire—Drawn	* 2,807,999	* 38,431	*21,046	* 2,867,476	4.0
Wire—Nails & staples	874,395	-	75	874,470	1.2
Wire—Barbed & twisted	237,604	-	-	237,604	0.3
Wire—Woven wire fence	483,920	-	-	483,920	0.7
Wire—Bale ties	83,831	-	-	83,831	0.1

* Revised Figures

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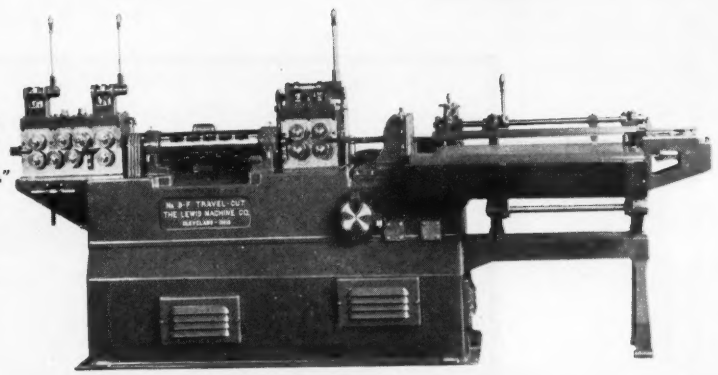
22 Models to handle from 1/16" to ¾" Round, Hex, Flat, Shapes.



Simple in design, rigid in construction, Lewis TRAVEL CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL CUT. Full details on request.

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Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne

Harper Electric Furnace Co. Moves to Larger Quarters

The Harper Electric Furnace Corporation, manufacturers of industrial electric furnaces and kilns, formerly located in Niagara Falls, N. Y., has moved its offices and plant to new and larger quarters at 39 River Street, Buffalo 2, N. Y. Production facilities are set up for one floor continuous flow manufacturing. The latest type materials-handling equipment facilitates all operations. The general offices and engineering departments are greatly enlarged. The new plant is located on the lake front and is served by private siding feeding major railroads.

★ ★ ★

The Corporation designs and manufactures a complete line of high temperature standard and special furnaces widely used for research and production requirements throughout the metal working and ceramic industries. They are made in sizes ranging from laboratory furnaces and studio kilns up to large tunnel units suitable for continuous production.

★ ★ ★

The Harper Electric Furnace Corporation was incorporated in 1924 and has representatives in principal cities throughout the United States.

★ ★ ★

Union Wire Rope Expanding Its Plant

Union Wire Rope Corporation is erecting five new buildings at its plant in Kansas City in an expansion program involving about $2 million. It is expected that the additional 109,000 square feet of floor space which will be provided will permit increasing the output of the wire mill by about 66%.

★ ★ ★

On completion of the expansion program, the company is expected to be the largest non-integrated producer of high carbon wire, and the country's fifth largest of all such producers. It is expected that part of the new facilities will be in operation during the second quarter of 1952, and provide total employment of about 625 people at the plant.

★ ★ ★

New Defense Production Bulletin

A new and comprehensive bulletin on heating and heat treating equipment for defense production has just been issued by **Surface Combustion Corporation,** Toledo, Ohio.

★ ★ ★

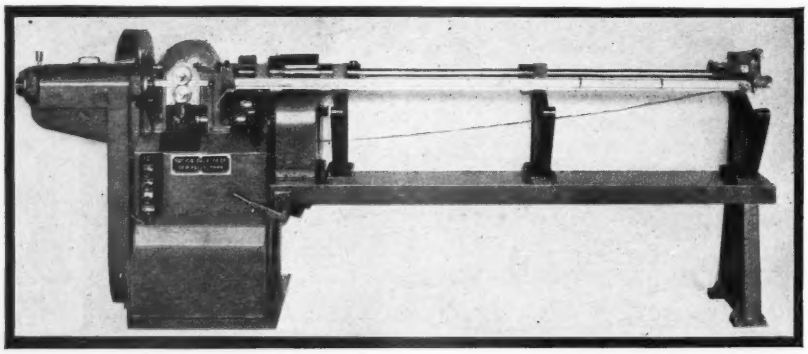
This new 8-page bulletin entitled "'Surface' Heating and Heat Treating Furnaces for Defense Production" comprises 8 pages and is printed in three colors. The bulletin covers heating for forging as well as heat treatments to develop the required properties for the production of all kinds of ordnance material. Among the items covered in the bulletin are ammunition, guns, tanks, aircraft and ships. The production of engines, power transmission equipment, as well as tools and special parts, is also covered.

★ ★ ★

This new bulletin is illustrated with views of operating installations of this equipment. Copies may be obtained by writing to Surface Combustion Corporation, Toledo, Ohio, and asking for Bulletin SC-150.

★ ★ ★

TYPE 1A



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ALMOST CONTINUOUS WIRE TRAVEL—A LIGHTENING CUT-OFF THAT ASSURES SQUARE ENDS—A HIGH-SPEED, DIRECT-DRIVEN 5-DIE STRAIGHTENING FLIER—QUIET, EFFICIENT V-BELT MOTOR DRIVE—BALL & ROLLER BEARINGS THRUOUT—EXTREME RIGIDITY—TYPES FOR CAPACITIES FROM .025" to 11/16" DIAMETER

Descriptive Folder Sent on Request

Mfd. by METTLER MACHINE TOOL, INC., 132 W. Lawrence St., New Haven, Conn.

SHUSTER *Automatic* *Since 1866* WIRE STRAIGHTENING AND CUTTING MACHINES

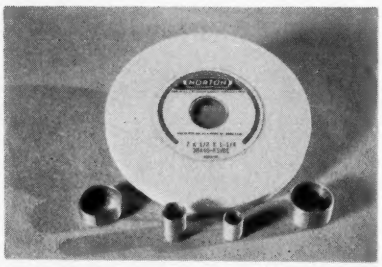
Norton Develops Precision Bushings for Grinding Wheels

Precision bushings for grinding wheels are the latest development in grinding wheel manufacture announced by **Norton Company** of Worcester, Mass.

★ ★ ★

These new patented bushings, which are pressed into the wheel, have several distinct advantages over poured lead bushings which have been standard practice for many years.

★ ★ ★



Norton Precision Bushings for Grinding Wheel.

The light weight of the new bushing, and its uniformity of size, preserve the inherent balance of wheels and make for uniform mounting conditions.

★ ★ ★

At the present time the new Norton precision bushing is being used in straight wheels 5″ to 8″ in diameter. Its use will be extended to wheels of other shapes and sizes as soon as manufacturing facilities permit.

★ ★ ★

New Products Developed by Atlas Mineral Products Co.

As a result of ten years of research in an attempt to develop a castable conductor of electrical current, Atlas Mineral Products Company has succeeded in producing a new and novel resin cement called **Conductoplast. Conductoplast** may be cast in almost any form and exhibits practically no voltage drop when used as a conductor. **Conductoplast** can be readily plated, it has a tensile strength of 1500 psi, a compression strength of 15,000 psi and excellent adhesion to ceramic materials.

★ ★ ★

As part of the development of **Conductoplast,** Atlas research chemists have also developed a nonconductor called **Resistoplast.** This product has much the same properties as **Conductoplast** except that it does not conduct current. Both materials are available in pilot plant quantities and production facilities can be expanded for critical end use.

★ ★ ★

The company also announces **Atlastic 58,** a hot melt corrosion resistant plastic product resulting from its continued research in the corrosion resistant field. This product has outstanding adhesion to concrete and steel and is resistant to a large number of acids, alkalies and salts.

★ ★ ★

For more information, please write **Atlas Mineral Products Company,** 42 Walnut Street, Mertztown, Penna.

The amount of electricity needed to produce five tons of aluminum will keep the lighted torch in the Statue of Liberty's hand burning for one entire year.

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the patented paper used in

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Is water repellent and
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Also manufacturers of many tailor-made
Varnishing, Saturating, Tubewinding
and Insulating Papers

Alcoa Expands Alumina Plant

Alumina production was approximately doubled by the middle of March at the East St. Louis Works of Aluminum Ore Company, D. H. Tilson, works manager, has announced. Aluminum Ore Company is a wholly-owned subsidiary of Aluminum Company of America.

★ ★ ★

Part of ALCOA's all-out effort to meet defense needs for aluminum, the East St. Louis plant-expansion program will cost more than $500,000.

★ ★ ★

The East St. Louis Works produces alumina from bauxite, the ore of aluminum. The alumina is then shipped to other ALCOA plants to be electrolytically reduced to pig aluminum.

★ ★ ★

New Electric Productimeters

The Durant Manufacturing Company, 1918 No. Buffum Street, Milwaukee 1, Wisconsin, announces an important addition of two new electric units to its line of Productimeter Counting and Measuring Machines. Except for size, these companion models are identical in design and appearance.

★ ★ ★

The smaller, identified as the "Y" Electric, is for light applications where reading is done at close range. It measures 1⅜" wide, 2-9/16" high, and 3¾" long. It will operate at speeds up to 1,000 counts per minute. The second unit is the "CS" Electric for heavy industrial applications, and features larger figures for distant reading. The dimensions are 2⅜" wide, 4-7/32" high, and 5" long, and the speed is up to 800 counts per minute. Standard voltage for both is 110 V. 60 C. AC.

★ ★ ★

The new type case provides compactness and rigidity. The design permits easy panel mounting or base mounting. The units are totally enclosed, affording great protection against dust and moisture conditions.

★ ★ ★

"Y" and "CS" Electric Counters are built to give accurate count; hardened steel working parts assure long life and dependability. Voltage fluctuations on normal industrial circuits have no effect on their accuracy. The two counters are available in 6 figures capacity and are resettable.

★ ★ ★

The company feels that these companion models will fill a long-felt want in the field of industrial and instrument counting, and that they are adaptable for practically all electric counting applications. Bulletin No. 55 on "New Electric Counters" is available on request.

★ ★ ★

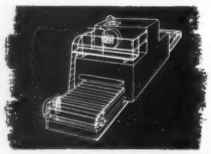
Offering Course on Statistical Quality Control

The College of Engineering at the University of Colorado will conduct an intensive training course in Statistical Quality Control from June 19-29, that will include acceptance sampling and other industrial statistical methods used in industry.

★ ★ ★

John F. Wagner, Assistant Professor of Applied Mathematics, who will be in charge of the course, says that because we are now faced with mass production problems in both civilian and defense goods, control of the quality of products has become an increasingly important management concern.

★ ★ ★



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Gratefully Yours,

MICHIGAN OVEN COMPANY

We are truly grateful to our many friends and customers who have helped us build, in so short a time, an organization which today:

- Is nationally recognized as one of the leading exclusive designers and builders of industrial ovens.
- Has its ovens returning a daily profit to its users in over 20 states and 5 foreign countries.
- Provides economical, compact, high-speed, production ovens for such diversified fields as: electrical manufacturing, wire enameling, textiles, foundries, paint finishing, munitions, light metal heat-treating, and many others.
- Offers custom-engineered ovens thru the entire range, from small cabinet type to large conveyorized units, for all fuels, and temperatures to 1100° F.

MICHIGAN OVEN COMPANY

4547 Grand River Avenue, Detroit 8, Michigan

Representatives in principal industrial areas

Instructors will be men who have had experience both in the teaching of this technique and in its application in industry and business. Wagner said that the course is most useful if men, who are acquainted with the overall production and inspection operations of a particular company, are trained in this technique.

★ ★ ★

An application or further information about the course can be obtained by writing John F. Wagner, College of Engineering, University of Colorado, Boulder, Colorado.

★ ★ ★

Youngstown Sheet and Tube Given Awards

The Youngstown Sheet and Tube Company received two of the awards announced by Freedoms Foundation at Valley Forge, Pa.

★ ★ ★

The company won fourth place in the company employee publications classification for its employee magazine "The BULLETIN" and an honor medal for its advertising program promoting freedom.

★ ★ ★

The basis for all judging is the official credo of Freedoms Foundation which defines the American Way of Life as an indivisible bundle of economic and political freedoms as set forth in the U. S. Constitution and Bill of Rights, based, in turn, on a fundamental belief in God.

★ ★ ★

"The Federal Labor Laws"

This useful manual for supervisors is a completely revised and up-to-date book published by the **National Foremen's Institute, Inc.,** New London, Conn. It covers the Taft-Hartley Act, the Wage and Hour Law, the Walsh-Healey Public Contracts Act, Social Security Act, U. S. Employment Service, Fair Employment Practices, Veterans' Rights and Railway Legislative Acts.

★ ★ ★

The book is designed to give a basic knowledge necessary to keep a company's slate clean and avoid tangles with inspectors and courts. The manual is in loose-leaf form so that changes in laws can be inserted as necessary. Such changes will be available at cost. The book sells for $2.50, with discounts ranging from 5% for 24 copies to 20% for 100 or more copies.

★ ★ ★

New Industrial Baking Oven

A new type, small, gas-fired baking oven for industrial purposes proves especially useful for (1) baking or tempering small production orders, (2) for heating samples, so that when large production orders are heated at the same temperature in large ovens, the results will be the same, and (3) for use in shops and laboratories for research, testing, precipitation hardening of beryllium-copper and other alloys, relieving hydrogen-embrittlement, drying cores, baking molds and plastics, and for many similar uses. Outside dimensions are 14″ wide, 16″ deep and 20″ high. Heating Chamber 10″ wide, 9″ high and 12″ deep with 2 shelves. Capacity is 250° to 650° F. Pyrometer actuated controller, 3″ dial thermometer, 2-60 minute timers, 2″ of insulation. Net Weight 75 Pounds. Made by **The Carlson Company,** 277 Broadway, New York 7, N. Y.

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Get top results in your acid-cleaning operations—use Parkin products in your pickling.

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This *improved* pickling won't cost any more because the *savings* in acid and metal resulting from the use of Parkin products more than makes up for their moderate cost.

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IN STEEL SINCE 1860

New Carbide Tool and Parts Catalog Issued by Carboloy

What is probably the most complete and useful catalog (No. GT-250) of carbide tools and parts ever published has just been released by **Carboloy Company, Inc.**, Box 237, Roosevelt Park Annex, Detroit.

The 60-page catalog covers all data in former Carboloy tool catalogs and their various supplements and many items that have been added.

It not only lists tools, etc., but tells how to select and apply them. For instance, the standard tool and blank sections include information as to most suitable uses of each type, plus an illustrated example or two.

The differences, and the limitations, in the various grades of carbide are clarified—not only for tool grades, but also for the wear-resistant grades. This makes it easy for the user to select the correct grade for practically any application of carbides in the tool or non-tool field, particularly since technical design and application data usually found only in manuals, is part of the catalog.

The catalog shows evidence of rapid development of non-tool uses for carbide. Many such applications have now become so much in demand that the appropriate carbide parts are now regular catalog items. Included are: tubing and other special shaped lengths in various sizes; more sizes of rectangular strips; solid guide bushings as used in the wire and other industries; carbide check valve seats; slotted guide rings for the textile and wire industry (eliminate threading of the ring); expanded lines of gage blanks; etc.

This catalog would seem to be one book every shop man, P. A. and design engineer should have. You are invited to write for it.

★ ★ ★

Detroit Steel to Double Capacity

Detroit Steel Corporation announces plans to double ingot capacity to 1,290,000 tons annually and to increase finishing capacity from 180,000 to over 1,000,000 tons at its Portsmouth, Ohio Works.

★ ★ ★

The major part of this program, estimated to cost about $50 million, will be subject to accelerated amortization under a Certificate of Necessity granted yesterday by the Defense Production Administration.

★ ★ ★

Among the new facilities included in Detroit Steel's expansion program are a second blast furnace rated at 1,400 tons, four additional open hearth furnaces of 250 tons capacity each, a new high lift 48" blooming mill, a new 5 stand 54 inch hot strip mill, a new 3 stand 54 inch cold rolled sheet mill, along with additional soaking pits; annealing furnaces; pickling, slitting, flattening and cut-off lines; and other related equipment for the production of hot rolled and cold rolled sheets.

★ ★ ★

Existing facilities at Portsmouth include an 800 ton blast furnace, ten 105 ton open hearth furnaces, a battery of 108 by-product coke ovens, an extensive by-product recovery plant, a 35 inch bloomer, a 24 inch bar mill, an 18 inch billet and sheet bar mill, a 17 stand 9/16 inch continuous rod mill, and complete equipment for the production of a wide range of manufacturers' wire, merchant wire, wire nails and welded wire fabric.

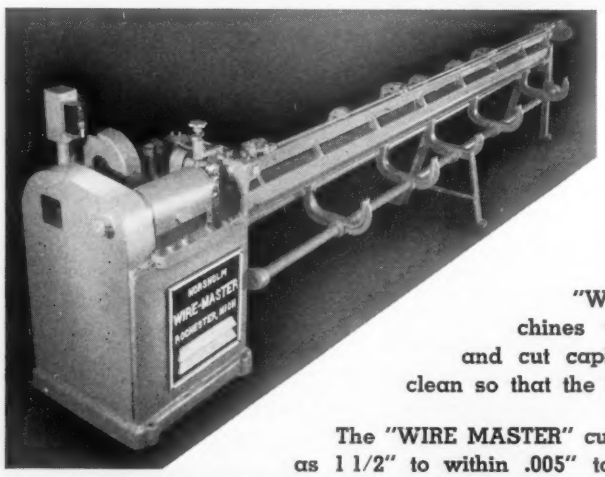
Faster, More Accurate

STRAIGHTENING and CUTTING

with the

NORSHOLM "WIRE MASTER"

So fast, a customer is finding that *two* machines will do the work of *six* machines formerly used.



Model A, shown, will handle .040" to .156" wire.

Other models will handle up to .312" Stock round.

NORSHOLM "WIRE MASTER" machines will also straight and cut capillary tubing. Cuts clean so that the hole is not closed.

The "WIRE MASTER" cuts lengths as small as 1 1/2" to within .005" tolerances, with the *cleanest and most accurate* cut-off on the market.

IT'S RUGGED, VIBRATIONLESS, FAST!

As to speeds, 180 to 200 F.P.M. is the minimum to be expected. Your cutting jobs will be studied and speeds *guaranteed.*

Also makers of heavy duty double, tilt type and single wire reels.

Write today for information on these remarkable machines

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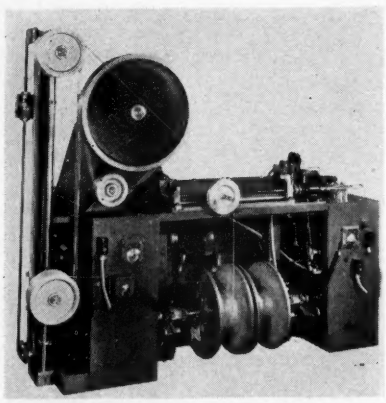
New Constant-Tension, Dual-Reel Takeup

A new high-speed constant-tension, dual-reel continuous extrusion takeup unit with integral capstan and tension stand, for plastic or rubber coated wire, cord or cable has just been announced by **Industrial Ovens, Inc.**

★ ★ ★



Industrial Ovens' new Dual-Reel Takeup * *

Speed range of this new takeup is from standstill to more than 2,600 feet per minute, with instantaneous acceleration of the empty reel to synchronous wire speed as soon as crossover is made. No interruption or slow down in the winding process is necessary to shift from full to empty reel.

★ ★ ★

All drives—for reels, capstan and traverse—are hydraulic and are completely self contained with fully enclosed, oil-immersed gears. There are no chains or open gears in the unit. The hydraulically driven traverse provides a 25 to 1 lay range.

★ ★ ★

An ingenious reel mounting—featuring a demountable shaft and bearing housing assembly carried by a heavy bearing mounting on a lever-operated, tilting base—permits loaded reels to be deposited gently on the floor upon the reel flanges so that reel damage and distortion are minimized. Provision has been made for "ends out" winding.

★ ★ ★

The entire unit is a complete, compact, fully integrated "package" ready for connection to power line. It is also available without the capstan or with separate, floor mounted capstan and tension stand. Complete specifications may be obtained from Industrial Ovens, Inc., 13825 Triskett Rd., Cleveland 11, Ohio.

★ ★ ★

"Controls Service" Issued

Publication of a new weekly "Controls Service," indexing and digesting the welter of new price, production and distribution regulations, has just been inaugurated by The Journal of Commerce. This new service consists of Master Editions of all-inclusive "Controls Guide" at six-week intervals, and weekly "Bulletin Summaries" designed to keep each master edition constantly up-to-date. The newest Master Edition has just been issued, containing an Index showing the restrictions now in effect on 1,697 different products and services, and the digest of 82 control regulations and their amendments. A timetable outlining "What's Ahead in Controls" is also included on a range of 32 product groups. Subscriptions to this weekly Controls Service may be had at $25 per year from the New York Journal of Commerce, 63 Park Row, New York 15. Master Editions of the "Controls Guide" are $1, each.

★ ★ ★

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UNION CITY, N. J.

Dimensions and Weight of Fibrous Glass Applied to Wire and Cable Constructions

(*Continued from page* 306)

on the yarn spread, number of ends of yarn per carries, number of carriers, diameter of conductor, and yarn thickness. The following formula was developed to determine the approximate picks per inch when the above variables are known.

Picks/inch =

$$K\sqrt{\left(\frac{1}{WE}\right)^2-\left(\frac{C}{2\pi(D+T)}\right)^2}$$

K = .63 class A braid

= .86 class B & C braid

W = Yarn spread (inches)

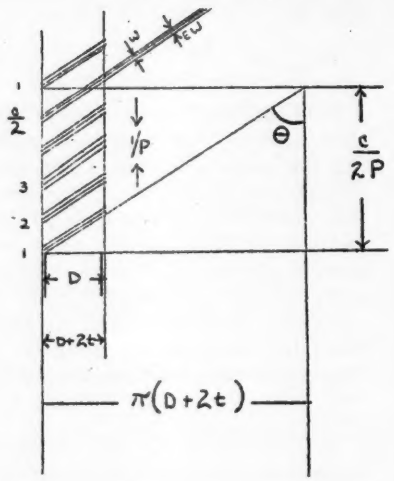

Figure 3

P = Picks per inch

C = Number of carriers

E = Number of ends on each carrier

D = Diameter of wire or conductor. Note in non-circular conductor

$D = \frac{\text{perimeter}}{\pi}$

N = Yarn Number

P = Ply

* * * * * * * * * * * * * * *

E = Number of end of yarn per carrier

C = Number of carriers

D = Diameter of conductor (inches)

T = Yarn thickness (inches)

★ ★ ★

The procedure in developing this formula is briefly setting up a percentage total coverage for the class of braid, this is the constant "K". The next step was to consider the number of picks if the yarn was applied from one carrier knowing the number of ends and the yarn spreads this is the term $\left(\frac{1}{WE}\right)$. Next the number of carriers and the diameter of the cable must be considered this is the term $\left(\frac{C}{2\ (D+T)}\right)$

★ ★ ★

Calculation of Pounds of Fibrous Glass Used Per 1000 Ft., Wire Braided, Wrapped, and Served

In addition to fibrous glass yarn coverage data it is also important to have available a method of calculating the pounds of yarn used per 1000 ft. of construction when the size and treatment on the yarn, diameter of the wire or conductor, and the variable, of the braider, (number of carriers, ends per carriers, and picks per inch) and server (pull out per revolution) are known. For preliminary construction design knowing the pounds of yarn used per 1000 ft. of wire construction is useful in

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determining the economics of the construction. This data is also useful in production planning. The yarn can be stripped from a given length of conductor, the weight recorded, and poundage per 1000 ft. calculated; however, on preliminary design, cable may not even be made up for this method of calculating and the following formula with accurate known variables should be more accurate on an average than the direct measuring method.

Derivation of weight formulas

Weight per 1000 ft. fibrous glass braid.

$$\text{Tan } \theta = \frac{2\,P\pi\,(d+2\,t)}{C}$$

The length of one thread per 1000 feet of wire = 1000 sec θ feet

The weight per 1000 feet of yarn $= \frac{3.3P}{N}$ (plain yarn) (Based on Yards average per pound plain yarn)

Using an approximate formula put out by Nema which assumes $\theta = 52°$ sec $\theta = 1.62$ Weight/1000 feet of braid =

$$\left[D\pi P + \frac{c}{2}\right]\left[\frac{5.35}{M}P\right] E \text{ (plain yarn)}$$

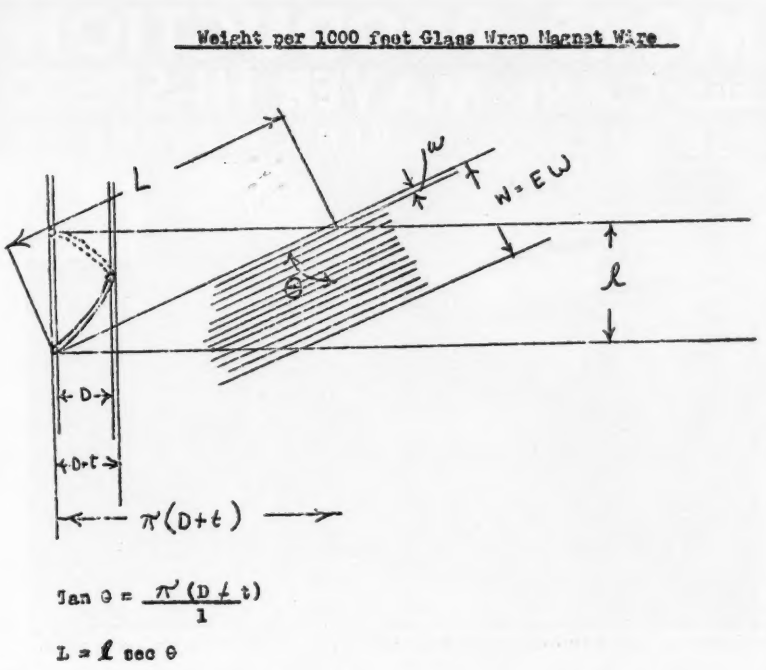

Figure 4

Note: 1 When using treated yarn multiply the weight obtained from this chart by a factor equal to the ratio of the yardage of plain yarn to the yardage of the treated yarn. Example: The factor for 150-1/0 standard waxed yarn $= \frac{14.700}{12,600} = 1.2$

★ ★ ★

Note 2: This formula can also be used to calculate pounds per 1000 ft. of wrap when wrapping with a Wardwell braider.

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Diameter Range — 1/16" to .005"

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DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

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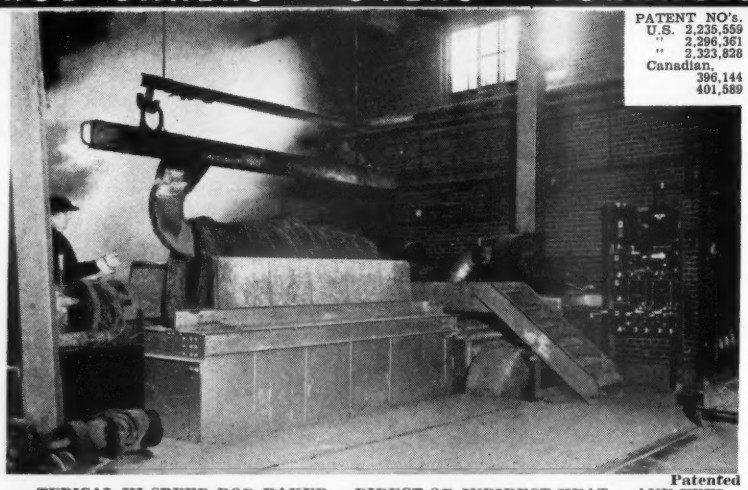

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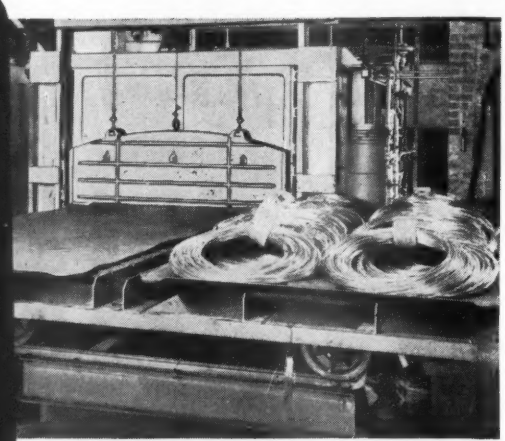

Gas-fired pan type furnace for annealing 5000 lbs. of medium gauge brass wire; furnace atmosphere controlled to produce oxide-free wire — in many cases practically bright. Other Rockwell furnace types include parallel tube, belt conveyor, pit, hood and others.

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W. S. ROCKWELL COMPANY

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In Canada: Francis Hankin & Co., Ltd. Montreal & Toronto

Weight per 1000 ft. fibrous glass served on wrapped wire

P = Number of plies

l = Pull out/revolution of magnet head

w = Width or spread of single thread

E = Number of ends

t = Thickness or build-up

D = Diameter of wire under wrap

L = Length of thread required to wrap 1 inches of wire.

Length of yarn required for 1000 feet of wire = 1000 sec θ

Weight of yarn per 1000 feet = $\frac{3.3\ P}{w}$ plain

Total weight fibrous glass textile material per 1000 feet of wire =

$$\left(\frac{3.3}{W}\ p\right) \times E \times \sec \theta \quad \text{(plain)}^*$$

Alignment Charts

The previously listed formulae do not lend themselves to rapid slide rule calculation, therefore, alignment charts (momographs) have been drawn up to facilitate rapid calculation of these formulas. (See Pages 304, 305 and 306.)

★ ★ ★

The author at this time does not deem it necessary to go through the mechanics of setting up these alignment charts nor a lengthy discussion of how to use these charts.

★ ★ ★

However, briefly, limits were set for the variables that would permit scales which would afford a good degree of accuracy and still cover the principal fibrous glass yarns used normal range of conductor sizes, normal range of braider and serving machine pull out speeds, normal number of braider carriers, principal number of ends of yarn per package. With a little care in using the charts a desirable degree of accuracy can be had, however, one may use the formulas for more exactness or for

*Note: (D+T) is the mean diameter and the thickness may be omitted in calculating the weight of wrap or serve on a conductor diameter over 0.1 inch for it is not significant.

★ ★ ★

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constructions not covered in the limits set for the variables.

★ ★ ★

On each chart there is a sample calculation, the steps being marked and arrows used to show which two points are connected with a straight line to project to a resultant point of how to use these charts.

★ ★ ★

For more detail on the development and use of alignment charts it is suggested reference be made to any of several books or phamplets denoted to alignment charts, one of these being entitled: "Development and Use of Monographs", published by the Ohio State University Experiment Station.

★ ★ ★

The Charts

(1) Dimensions of fibrous glass yarn applied to wire & cable; (2) Required picks per inch for fibrous glass braid covered wires & cables; (3) Pounds of fibrous glass used per 1000 ft. of braid covered wires & cables; (4) Pounds of fibrous glass used per 1000 gt. of wrap covered wire & cable; and (5) Pounds of fibrous glass used per 1000 ft. of single serve covered magnet wire.

★ ★ ★

These charts as noted: With the expanding applications for fibrous glass in wire and cable constructions it is the hope of the author that this data may help the wire and cable engineers in their design work.

★ ★ ★

Paper on Phosphate Coatings for Aluminum Available

A technical paper, written by **Alfred Douty** and **F. P. Spruance, Jr.** of the **American Chemical Paint Company,** Ambler, Pa., entitled "Amorphous Phosphate Coatings for Protection of Aluminum Alloys and for Paint Adhesion" is available upon request from the company. It was originally presented before an American Electroplaters' Society meeting.

★ ★ ★

It describes the corrosion to which these alloys are normally subject and the role of phosphate coatings, not only in preventing continued oxidation and corrosion, but in providing protection and other valuable characteristics imparted electrical uses, coating bases, etc. Please write to ACP for your copy.

★ ★ ★

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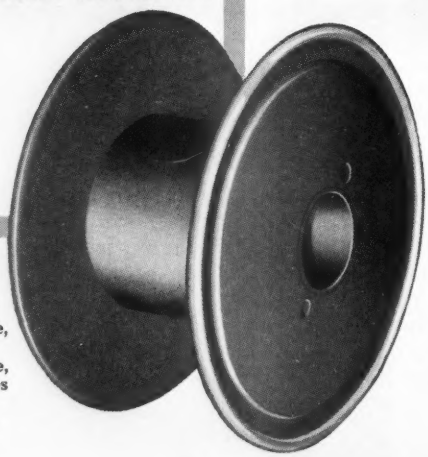

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Speeds of 1000 counts per minute. Both counters give maximum readability. Design fits all mounting conditions . . . panel mounting or base mounting. Hardened steel working parts for long life and dependability.

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Write for "New Electrics" Bulletin

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A New Hand Operated Spring Coiler Proves Useful in Industry

(*Continued from page* 316)

up to 4", up to 25 coils for compression springs, up to 100 coils for extension and torsion springs, and pitches from 0 up to 1 inch. Oversize arbors to give larger spring diameters and coned arbors for making conical springs may be easily made to suit special requirements. Compression springs are wound with a uniform pitch, to any exact length, and the end coils are closed or squared automatically. Extension and torsion springs can be made with short or with long lengths on each end for forming extended hooks or loops.

★ ★ ★

The coiler is hand operated and three coils are produced by one turn of the handle. Left-hand compression springs are made with the arbor and chuck placed on the inner shaft, and right-hand springs are made with the arbor and chuck on the outer shaft. Extension and torsion springs may be made left-hand or right-hand with the arbor and chuck on either shaft. The lower horizontal bar is adjustable to determine spring lengths and the long cam is adjustable at various angles to determine the pitch or spacing of the coils. The short vertical cam and the distance from the cam roller to the long cam are adjustable so that any number of closed coils may be made on each end of compression springs. The position and movement of the vertical rack is also adjustable to make the number of coils desired. The diameter of a spring is determined by the arbor over which the wire is wound, and a friction holding device on the tool post is adjustable to grip the wire and provide the proper amount of tension. The gross shipping weight in a wooden box is 45 pounds.

★ ★ ★

The pictures shown were taken in a toll register manufacturing plant in Brooklyn, New York, and in a solenoid valve manufacturing plant in Orange, New Jersey.

Advertise! You'll get more than orders. You identify yourself with the industry buying your products and secure its good-will also.

New Book on Lubricants Published

Metalworking Lubricants, a book just published by **McGraw-Hill,** provides a comprehensive and practical coverage of all types of fluids and compounds used to facilitate metalworking processes. The nature, selection and application of lubricants and fluids are thoroughly discussed. Those used in forming non-metallic engineering materials, such as plastics, are also analyzed.

★ ★ ★

Though it deals primarily with practical shop and plant aspects, this book also includes adequate technical and theoretical explanations of the problems involved in the use of metalworking fluids and lubricants. Illustrations of actual shop operations which demonstrate the various lubricant applications, tabulated data on the properties of lubricants and fluids, and charts containing recommendations for specific applications, make this volume an easy-to-use reference work. They also provide solutions to numerous questions which arise when it comes to selecting and using the right lubricant for a given operation.

★ ★ ★

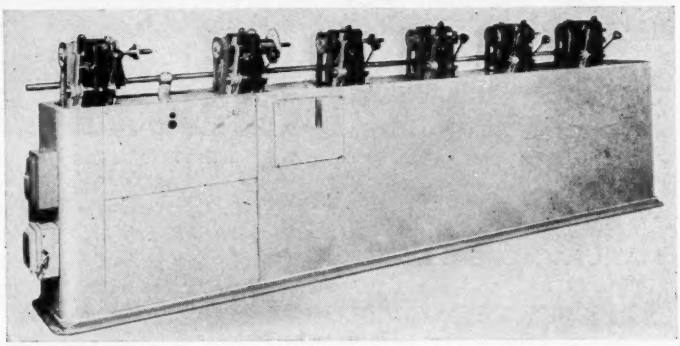
One chapter is devoted to drawing fluids and compounds and another to extension and extrusion compounds, both of which will be found useful to the wire industry.

★ ★ ★

The author, E. L. H. Bastian, discusses all important advances made in the field, among them pretreatment processes, "Hyper-Drilling" with soluble oils, modern rolling oil developments, atmosphere tempering and stress-relief, and grease rolling stability test apparatus. New lubricants such as molybdenum disulphide, chemically active waxes, water-miscible oils for drawing fine-gauge wire, spinning lubricants used for TV tube production, and a variety of synthetic fluids and compounds are all covered in detail.

★ ★ ★

Mr. Bastian is Staff Engineer, Products Application Department, Shell Oil Company, New York. He has served as consultant on numerous metalworking problems throughout the United States and has written many technical papers and articles on metalworking fluids and



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This spooler is outstanding for its many unusual and desirable features.

Takes spools up to 16" flange diameter. Enclosed types, with mechanism readily accessible from rear side. Spindles mounted on ball bearings and each may be stopped or started individually. Uses Worthington All-Speed Drive unit.

All Emory Spoolers supplied standard or equipped to meet customers' special specifications.

On Spooling problems, consult

ROBERT J. EMORY COMPANY

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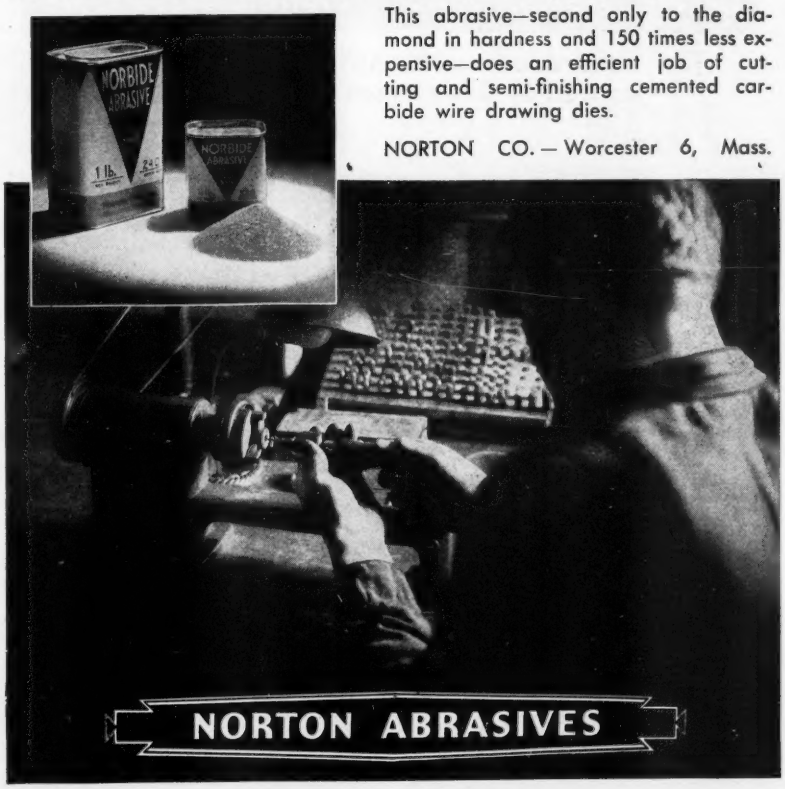
NORBIDE Abrasive: Effective, Economical

This abrasive—second only to the diamond in hardness and 150 times less expensive—does an efficient job of cutting and semi-finishing cemented carbide wire drawing dies.

NORTON CO. — Worcester 6, Mass.



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in accordance with ASTM Specifications as well as Government requirements

WIRE TESTING

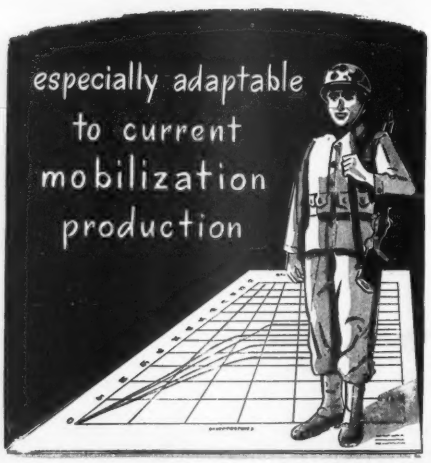
A complete line of light-capacity strength and elongation testing equipment up to 2,000 lbs. capacity. Recording is either visual; or permanently, in the form of 'picturized" graphs.

INSULATION TESTING

For tensile strength and elongation; compression-cutting; plasticity or viscosity; permanent set.

TORSION TESTING

Torsion test equipment also supplied for the same range of applications.



REQUEST CATALOG 50

SCOTT TESTERS, INC. 55 Blackstone Street Providence, R. I.

Scott Testers — Standard of the World

their applications, some of which have been published in Wire and Wire Products.

★ ★ ★

Metalworking Lubricants is priced at $6.00. McGraw-Hill's Book Information Service, 327 West 41st Street, New York 18, N. Y. will supply further information.

★ ★ ★

First War Mobilization Loan Allocated to Standard Cable Corporation

The country's first War Mobilization Loan, totaling approximately $2,900,000, has been allocated to **The Standard Cable Corporation** of Chickasha, Oklahoma, through the R.F.C. at Oklahoma City.

★ ★ ★

The funds will be used to assist the wide expansion program being undertaken by Standard Cable, upon completion of which, according to William D. Claypool, Vice President, Standard Cable Corporation will be the largest single wire and cable manufacturing unit in the nation.

★ ★ ★

Chief product of the newly built Chickasha plant is combat telephone wire. The firm is currently producing 45,000 miles of Signal Corps combat telephone wire on contracts exceeding $3,000,000.

★ ★ ★

First step in the extensive expansion of operations by Standard Cable was its move from Westerly, Rhode Island, to Chickasha, made in December 1949. The relocation in the Southwest was a key factor in improving Standard Cable's distribution set-up.

★ ★ ★

To date, Standard Cable is the only wire firm in the United States that has agreed to give one hundred per cent of its capacity to the government immediately. The company is headed by L. W. Lord, President.

★ ★ ★

Pangborn Corporation Offers 50-Page Book on Dust Control Technology

Detailed selection, operation, and maintenance data for the plant engineer responsible for dust control is contained in a 50-page, 5" x 7¼" digest-size book—"Industrial Dust Control Through Exhaust Systems"

you measure by output

Technological advances move fast! Check your own equipment, and chances are you'll see the true economy of replacing it — with new, improved H-D twisters, ropers, layers, bunchers and stranders. Current models embody many time-saving advances that result in improved quality and quantity of output. Work is perfectly tubed, free from riding ends, regardless of ply; a round bunch of the correct diameter for the desired count or ply is also assured. Consult our engineering department for recommendations. TODAY, write for informative bulletins.

HASKELL-DAWES
MACHINE COMPANY, INC.
2231 E. ONTARIO STREET
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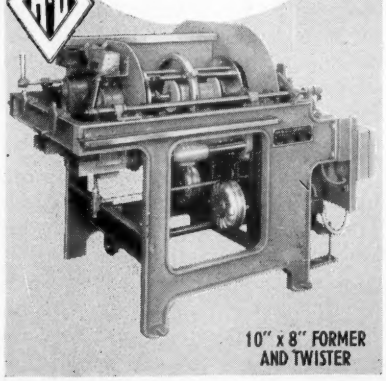


10" x 8" FORMER AND TWISTER

—offered by the Pangborn Corporation, Hagerstown, Md. Liberally illustrated with 15 photographs and 10 line drawings, the book treats, in three major sections, (1) Exhaust Hoods and Piping Systems, (2) Dust Collecting Equipment, and (3) Exhausters and Drives.

★ ★ ★

Introductory chapters list six basic methods of accomplishing dust control; give reasons why improperly planned dust collection installations do not fully perform their function; tell why experienced engineering skill should be applied to the dust collection problem; and analyze with text and line drawings the three basic elements of dust control exhaust systems.

★ ★ ★

To make the book specifically helpful to the individual reader, a detached problem sheet is included on which the reader can enter data particular to his case. Compilation of this data expedites the work of the dust control engineer when working out system details.

★ ★ ★

Copies of "Industrial Dust Control Through Exhaust Systems" may be obtained free of charge from the Pangborn, Corp., Hagerstown, Md.

★ ★ ★

Carboloy to Expand Detroit Facilities and Build New Plant in Edmore, Michigan

A $2,800,000 plant expansion program to meet rapidly increasing demand under the defense program for tungsten carbides in various forms has been launched by **Carboloy Company, Inc.** a General Electric affiliate and world's largest producer of cemented tungsten carbides.

★ ★ ★

Of the total, approximately $800,000 is being devoted to expanding the present Carboloy plants on 8-Mile Road, Detroit, while $2,000,000 is for construction and equipping of a new plant in Edmore, Michigan. Certificates of Necessity have already been issued for a major portion of this expansion by the National Production Authority.

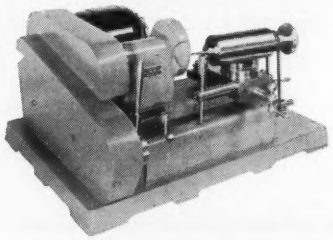
★ ★ ★

The Detroit expansion will provide approximately 13,000 square feet of additional production area plus increased facilities for manu-

ROOS DYKREX

MACHINE CORRECTS AND REJUVENATES YOUR DIES

to original condition



IT'S MORE than a POLISHER

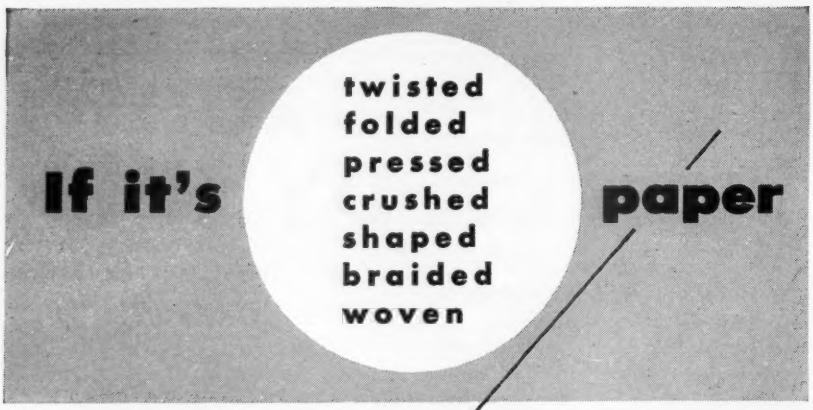
IT'S MORE than a LAPPER or RIPPER

It corrects the die by straightening out any eccentric entrance angles on the dies.

ROOS TOOL & Mfg. Co.

33-35 BLOOMFIELD AVENUE
NEWARK 4, N. J.

Distributed by
Eastern Carbide Corp., New Rochelle, N. Y.
Carboloy Co. — Detroit — Pittsburgh — Newark — and all Principal Cities.
In Canada — Canadian General Electric Co., Toronto, Canada.



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treated braiding and wrapping yarns

treated wire-rope cores

slit kraft or jumbo rolls for crushing and wrapping operations.

treated fillers for 2- and 3-wire non-metallic sheathed cable, varnished cambric, shipboard, parkway, and other power cables.

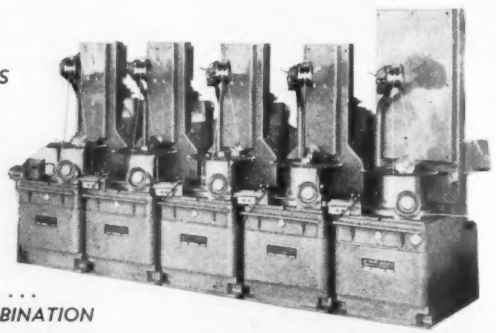
E. W. TWITCHELL INC.

Third & Somerset Streets, Philadelphia 33, Pa.

AETNA-STANDARD WIRE DRAWING UNIT

- DESIGNED FOR COMPLETE VERSATILITY
- BUILT FOR SAFE, EFFICIENT PRODUCTION
- SINGLE OR MULTI-DRAFT OPERATION
- INTERCHANGEABLE UNITS AND PARTS
- AUTO-RHEOSTATIC SYNCHRONIZATION
- WATER COOLED BLOCKS AND DIES

FERROUS OR NON-FERROUS



WET OR DRY LUBRICANTS

SINGLE UNIT ... OR ANY COMBINATION

THE AETNA-STANDARD ENGINEERING CO.

YOUNGSTOWN, OHIO

ASSOCIATED COMPANIES: HEAD, WRIGHTSON & COMPANY, LTD., THORNABY-ON-TEES, ENGLAND
AETNA-STANDARD ENGINEERING COMPANY, LTD. . . . . TORONTO, ONTARIO, CANADA

facture and storage of hydrogen—used in the sintering of metallic carbides.

★ ★ ★

Productive area of the new Edmore, Michigan plant will be approximately 45,000 square feet and will provide employment for approximately 200 when completed. The new plant will have complete tungsten carbide processing facilities—from powder (tungsten, carbon, etc.) to finished products.

★ ★ ★

In announcing the expansion, **K. R. Beardslee,** President of the Company, stated that with completion of the expansion, 50% of Carboloy's carbide metal output will be directly for defense, under government contract, while the other 50% will be indirectly for defense—in the form of carbide tools and dies needed by U. S. Industry for the production of equipment for the armed services and essential civilian needs.

★ ★ ★

Bright Decorative Metal Finish Provided Without the Use of Critical Materials

Hundreds of consumer items normally supplied with bright nickel, chromium, tin, copper or brass finishes may not revert to non-durable dull lacquer substitutes due to defense production restrictions, according to **Herbert Kenmore,** president of the **Kenmore Metals Corporation,** 380 Ninth St., Jersey City 2, N. J., who reports that his Company has developed an entirely new process for electroplating silver on steel wire and rod.

★ ★ ★

Silver is not on the critical materials list. The use of silver plated steel is one of a very few instances where a better substitute material has been developed without decreasing quality in the finished product or tending to create a scarcity of other material.

★ ★ ★

The new process has been worked out so that large quantities of silver plated steel wire and rod may be produced quickly and at a cost comparable to that for nickel or brass plated material. Improved continuous plating methods and precise process control permit the use of

unusually small amounts of silver for a durable, decorative finish.

★ ★ ★

The development should mean that manufacturers of television antennas, coat hangers, woven wire products, toys, bird cages, curtain rods, dish strainers, lamp shade forms, fan guards, potato mashers, paper clips and hundreds of other consumer items will actually be able to offer the public a silver plated product .

★ ★ ★

Referring to current demand for plated steel wire and rod, Kenmore said that his Company produced over a million pounds during January and that most of it went into consumer goods. Metals used, largely for decorative purposes, included nickel, chromium, tin and brass, which will not be available for consumer products after present stocks are exhausted.

★ ★ ★

Pamphlet on Electroplating

Joseph B. Kushner, Ch. E., Consulting Electroplating Engineer, 115 Broad Street, Stroudsburg, Pa., has issued a 10 page multigraph brochure, entitled "The Real Secret of Better Plating".

★ ★ ★

This interesting treatise, stressing the role of electroplating operatives in producing successful plating work, is available without charge to any of our readers. Please write to Mr. Kushner for your copy.

Sjogren - DOGS

LIKE other S & S products are rugged; they stand use—and abuse. These dogs are simply made and easy to maintain. Ordinary pressure upon the thumb-screw locks them in position. Assurance they will hold their setting relieves worry from the possibility of the dog turning on the block-pin while in use. S & S dogs are made with a large body and full face; giving ample support to wire being coiled. All sizes of Sjogren Dogs may be attached or removed from the block-pins without lost time or removal of the end plates.

Used by Wire Men Who Want the Best!

SJOGREN TOOL AND MACHINE CO., INC.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

14 SWORD STREET AUBURN MASSACHUSETTS

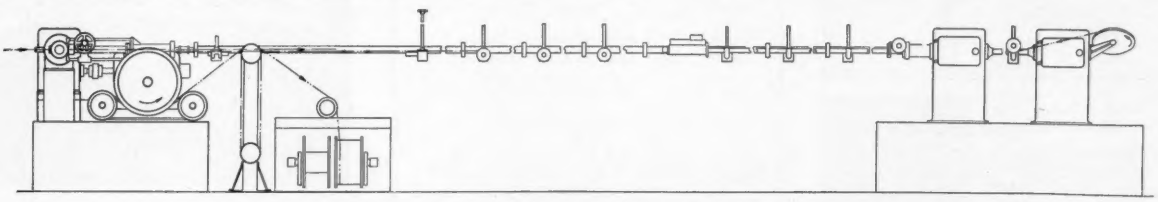
Represented in Canada by THE LARSON CO., 98 Wellington St., West, Toronto, Ont.

A Pre-Finish Metal Cleaner

A special acid phosphate cleaner developed expressly for the preparation of metal surfaces for painting, lacquering or japanning, has been added to the Houghton line of metal cleaners by **E. F. Houghton & Co.**, of Philadelphia.

★ ★ ★

This cleaner, named Houghto-Clean 313-A, conditions metal for final-finishing by removing soil, such as processing oils and compounds, rust preventives, perspiration and soldering residues, and then deposits a smooth, dry coating of phosphate on the metal surface to provide greater adhesion of the



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COMPLETE CONTINUOUS-VULCANIZING UNITS

THE STANDARD MACHINERY COMPANY, MYSTIC, CONN., U. S. A.

Established in 1848 *Incorporated in 1875*

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How would you like a good foreman's position with unlimited possibilities for your advancement?

A small but highly modern steel mill in the Newark, N. J., area is looking for a foreman with *practical shop experience.*

You will have an excellent chance to use your abilities to the the fullest extent.

You can advance with this growing concern.

The salary is high with an attractive bonus arrangement.

Write, giving your experience. Appointment will be arranged.

Box #602 Wire and Wire Products.

finishing material. This action is fast, thorough and reliable, allowing for speedy production, a saving in paint and a more durable finish.

★ ★ ★

It also protects against rust. Parts cleaned but not painted immediately will not corrode. Should the paint become scratched after application, the protective phosphate film resists rust and prevents its spreading beneath the paint.

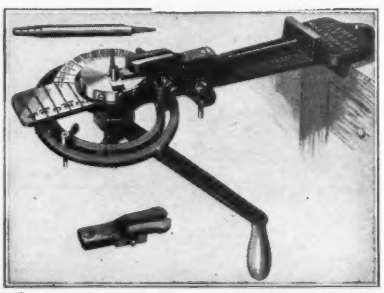
★ ★ ★

This cleaner is simple and inexpensive to use, mixes easily with water, needs no rinse in most cases, and requires no special equipment. It can be used in still tanks or power washers. A descriptive Product Data Sheet is available upon request. Write to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

It is remarkable how easily the Havenots can tell the Haves how they have to manage their business . . . but if the Haves managed their business in the manner in which the Havenots tell the Haves they have to . . . the Havenots would not have what the Haves make it possible for the Havenots to have.

—from "Hot Off The Anvil"

KILMER WIRE FORMER



Forms Eleven Sizes of Eyes from Flat, Round, Square or Half - Round Stock, also Almost Any Shape Desired

Adjustable for No. 8 to No. 21 Gage Wire

The cut on right shows a few of the thousands of the forms made on this **WIRE FORMER**

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BELL-MINE

LIME

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WIRE DRAWING

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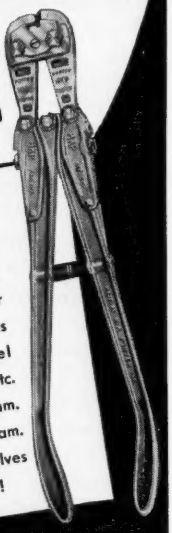
PORTER CARBIDE-EDGED CUTTERS

for extremely hard materials, including stainless steel.



Stand up under the hardest usage. Tough carbide edges firmly brazed to cutting jaws. Excellent for extra hard materials like stainless steel rods, wires, pins, etc. #3 cuts to 5/16" diam. #2 cuts to 3/8" diam. Pay for themselves many times over!

ORDER THROUGH YOUR INDUSTRIAL SUPPLY HOUSE

H. K. PORTER, INC., Somerville 43, Mass.
Manufacturers of **PORTER CUTTERS, PORTER PRUNERS** and **PORTER-FERGUSON** Auto Body Fender Repair Tools

Top quality non-returnable spools . . available in standard head and barrel sizes.

Write for a quotation today!

MASON CAN COMPANY
1949 Dexter Rd., East Providence 14, R. I.
MASON CAN COMPANY OF OHIO
Greenville, Ohio

New Protective Coating Announced

Development of a new air-drying plastic protective coating has been announced by **United States Rubber Company.**

★ ★ ★

The new coating is used to protect tanks, tank cars, pipes, fittings, structural steel parts and chemical processing equipment against attack by splash, drip and spray from corrosive chemicals, corrosive atmospheres, weathering and rust.

★ ★ ★

The plastic combines high film flexibility with good adhesion and impact resistance. It will not chip or crack and can be used on steel, aluminum, concrete, hardwood, or composition board. It is applied by spray, allowing one hour drying time between coats and 24 hours drying time after the final coat. It requires no primer and can be produced in a variety of colors. Since it contains no chemical plasticizer to leech out or harden, it retains its flexibility throughout its service life.

★ ★ ★

A sharp instrument will cut through the film but the break can be repaired easily by "touching up" with brush or spray. Metal should be grit or sand-blasted before the coating is applied, cement should be etched with hydrochloric acid, while wood and composition board needs rough sanding to assure a good bond.

★ ★ ★

The new coating is in pilot plant production at the company's Providence, R. I., plant. It will be marketed by the mechanical goods division under the trade name U. S. Royalguard protective coating.

★ ★ ★

Crucible Steel Appointments

R. F. Chaffin was appointed electrical engineer for all plants of **Crucible Steel Co. of America,** Pittsburgh. **R. S. Hurtt** succeeds Mr. Chaffin as superintendent of electrical maintenance department at the Midland Works, and **John F. Kostelac** succeeds Mr. Hurtt as assistant superintendent.

★ ★ ★

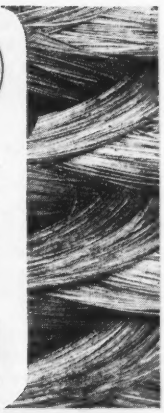
WIRE FOR WEAR

CONTINENTAL STEEL CORP. STEEL CONTINENTAL WIRE KOKOMO, IND.

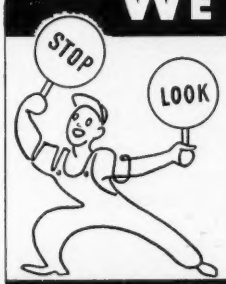
● IMPROVED THROUGH RESEARCH
● PROVED IN HARDEST USE

Constant improvement through research and constant proof in toughest use have established Continental as the "wire for wear." Whether the need is for wire to stand up under difficult forming operations . . . or for a special shaped wire to provide smarter-looking, longer-lasting trim . . . Continental is the wire that wins friends and holds customers. Write us at Kokomo.

CONTINENTAL STEEL CONTINENTAL STEEL CORPORATION



WE BUY WE SELL



We Pay Highest Prices for Used Machinery

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CABLER with TAPING HEAD
Capstan and Motor and Take-Up Stand

All Machines Reconditioned in Our Own Shop

WIRE & TEXTILE MACHINERY INC.
P. O. BOX 436, PAWTUCKET, R. I.

REELS SPOOLS
ALL SIZES

WOOD-PLYWOOD-WOOD-METAL

RETURNABLE NON-RETURNABLE

Samples and Prices on Request

DURKEE MFG. CO. PINE RIVER, MINN.

MUSIC WIRE and SPECIAL WIRES

Music Wire for Industrial Purposes
In Over 100 Sizes, Polished and Tinned, from .0015" to .359" in dia.

Aluminum — Annealed — Belt Lacing — Brass, Soft and Spring — Copper, Bare and Tinned Coppered Steel Spring — Galvanized — Tinned
Monel — Nickel Silver — Pure Soft Nickel — Oil tempered, Steel Spring, Black Finish Phosphor Bronze, Spring Temper — Picture Wire — Iron Wire, Pure — Resistance Wire, Hoskins Chromel "A" — Stainless, Soft and Spring Temper — Tag Wire, 1000 in an Envelope — Florist Wire — Spooled and Coiled, ¼-½-1-5#

Wires Straightened and Cut to length — Small Gauges — Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.

THE MALIN & COMPANY
2514 Vestry Ave. Established in 1884 Cleveland 13, Ohio

BORAX

An increasingly popular and satisfactory coating material for the dry drawing of ferrous wire

The acceptance of Borax as a coating material by an increasing number of the larger manufacturers of dry drawn ferrous wire is a testimonial to its effectiveness and satisfactory performance.

BORAX

- —is clean, safe, and easy to handle.
- —reduces dust nuisance, improves working conditions and boosts workers' morale.
- —coating gives protection to wire against rusting, permitting storage of coated wire for longer periods.
- —is reported as giving increased die life.

Give Borax a trial. Improved results have been obtained by using higher concentrations, some using as high as 30 to 40 ounces per gallon.

Wire for Bulletins

PACIFIC COAST BORAX CO.

Division of Borax Consolidated, Limited

LOS ANGELES NEW YORK
CHICAGO PHILADELPHIA CLEVELAND

Manufacturers of the "20 Mule Team" package products

DIAMOND POWDER RECLAIMING

A new and more efficient process has been developed that recovers higher percentages of greater purity of used diamond powders.

Diamonds from worn diamond grinding wheels, grinding wheel sludge and dust, cotton charged with powder used in die polishing, die washings and other diamond bearing scrap—all

RECLAIMED SUCCESSFULLY

Don't waste valuable diamond bearing material.

Send it to

NATIONAL RESEARCH CO.

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MICHIGAN

New Solvent Makes Water Rustproof

A liquid chemical, "Immunol" has been developed which when added to water, hot or cold, immunizes it against rusting ferrous metals. In addition it imparts unusual detergent properties and complete "wetting out" action. Immunol solutions are odorless and neutral, contain no soaps or alkalies, are noninflammable and will not affect the skin. Replaces alkali cleaners and inflammable solvents.

★ ★ ★

Immunol has a number of applications in the wire field. Coil of wire dipped in a 1-30 solution prior to spooling prevents looping. Wire to be woven into screening similarly dipped improves weaving. Such treatment for both operations imparts rust protection. Added to lime solution its wetting properties gives lime better adherence to rods and reduces friction in drawing.

★ ★ ★

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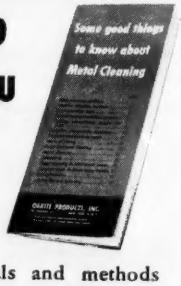

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Heil Announces Appointments

Appointment of **Edwin Vereeke** to the position of Sales Manager, with charge over all sales and advertising, is announced by the **Heil Process Equipment Corporation,** Cleveland, manufacturers of chemical-resistant tanks and linings, tank heaters, anodes, and related products. Mr. Vereeke has been with the Heil Corporation in the capacity of District Sales Suervisor.

★ ★ ★

Also announced are the appointments of **Robert Peters** as Sales Engineer for the area west of Cleveland, and **Ken Grader** as Sales Engineer in charge of the area east of Cleveland. Mr. Peters was previously an Estimating Engineer for Heil. Mr. Grader, formerly of Philadelphia, will make his headquarters in Cleveland.

★ ★ ★

These appointments are in line with a policy of expanding service for the well-known Heil line of "Chemical-Proof" Tanks, Tank Linings, Lined Pipe, Heat Exchangers, Jet Agitators, Lead Fabricated Products, and similar products for the chemical, product finishing, plating, and metal working industries.

★ ★ ★

Lamson & Sessions Co. Appoints James W. Rowe

James W. Rowe, vice president and general manager of the Birmingham plant of **Lamson & Sessions Co.,** Cleveland, was elected a director to succeed the late **George S. Case.**

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Bulletin on Brazing

A new bulletin—No. 124—describes the Ajax Salt Bath Brazing Process.

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For a copy of bulletin No. 124, please write to **Ajax Engineering Co.**, Frankfort at Delaware Ave., Philadelphia 23, Pa.

★ ★ ★

New Vest-Pocket Electrode Guide by P&H

Now being distributed is a new 56-page electrode guide, covering all P&H Welding Electrodes. Of pocket size for easy reference, the electrode guide has page tabs marking the various classifications of electrodes. A helpful feature is the 2-page comparative chart which lists corresponding types of electrodes.

★ ★ ★

A copy of the P&H Welding Electrode Guide may be obtained free by writing **Harnischfeger Corporation**, Welding Division, 4400 West National Avenue, Milwaukee 14, Wisconsin. Ask for Bulletin R7-8.

★ ★ ★

New Materials Handling Catalog

A new comprehensive catalog of materials handling equipment has been released by the **Yale & Towne Manufacturing Company's** Philadelphia Division. Subjects covered include a general description and application data on Yale's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks, and hand and electric hoists.

★ ★ ★

One particularly interesting section describes the various attachments available for Yale industrial

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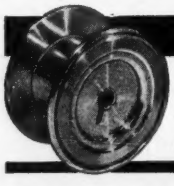

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For a copy of this 44 page bulletin write to the Yale & Towne Manufacturing Company, Philadelphia Division, 11000 Roosevelt Boulevard, Philadelphia 15, Pa.

★ ★ ★

Second Issue of "Heat Treat Review"

The second number of the "Heat Treat Review", published by Surface Combustion Corporation, Toledo, Ohio, has just been printed and is being distributed to those concerned with the field of metals heat treatment.

★ ★ ★

A feature of this 8-page issue of "Heat Treat Review" is an article on gas carburizing furnaces, their design and operation, giving actual data as gathered in the field. An editorial on depreciation allowances defines industrial problems in this activity and suggests means for alleviating same. Drawings, graphs and photographs are used to illustrate these articles.

★ ★ ★

Copies of this magazine may be obtained upon a written request to The Editor, Heat Treat Review, Surface Combustion Corporation, Toledo 1, Ohio.

★ ★ ★

Catalog on Latex-Insulated Cables

The electrical wire and cable department, **United States Rubber Company,** has published a new catalog on specifications and engineering characteristics of latex insulated telephone cables. Statistics on capacity and power factors, transmission characteristics, ag ng, tensile strength, resistance and constructions, are included. A special section is devoted to a new cable splice housing developed by U. S. Rubber engineers which eliminates hand taping. The booklet is obtainable from the department s headquarters in Rockefeller Center, N. Y.

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Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Houghton, E. F., Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
The Parkin Chemical Company, Pittsburgh, Pa.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Holden, A. F., Company, The, Detroit. Mich.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
Youngstown Welding & Engineering Co., Youngstown, Ohio

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, O.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Techema Co., The, Toronto, Canada

COMPOUNDS—Diamond
Eastern Carbide Corp., New Rochelle, N. Y.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CORROSION PREVENTIVES
Angier Corporation, The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Diamond Distributors, Inc., New York, N. Y.
Diamond Tool Research Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Diamond Distributors, Inc., New York, N. Y.
Diamond Tool Research Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
National Research Company, St. Claire Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING
Diamond Tool Research Co., New York, N. Y.
National Research Company, St. Claire Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Diamond Tool Research Co., New York, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Metal Carbides Corporation, Youngstown, Ohio.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hartley Tool & Die Co., Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
American Carbide Die Company, Union City, N. J.
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

WHERE TO BUY, Continued

DIES—Special Shapes, Etc.
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Ft. Wayne, Ind.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Swaging
Murex, Ltd., Rainham, England.
Sjogren Tool and Machine Co., Inc., Auburn, Mass.

DIES—Tantalum Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tube Drawing
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tungsten Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting
Copper—Leonard D. Walde, North Plainfield, N. J.
Metal Fatigue—Fatigue of Materials Laboratory, Princeton, N. J.
Spring Design—Carlson Co., The, New York, N. Y.
Wire Mill—Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Company, The, Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Ox'idizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.
Holden, A. F., Co., The, Detroit, Mich.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOOKS—Pickling & Liming
Bronze Die Casting Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin Chemical Company, The, Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.
Owens Corning Fiberglas Corp., Toledo, O.
Standard Varnish Works, New York-Linden, N. J.-Chicago
Twitchell, E. W., Philadelphia, Pa.

INSULATING MATERIALS—Paper—For Electric Wire Cable.
Merrimac Paper Co., New York, N. Y.
Twitchell, E. W., Philadelphia, Pa.

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Roos, Tool & Mfg. Co., Montclair, N. J.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

LUMBER—Wire Mill, for lagging and car blocking
North Anson Reel Co., North Anson, Maine.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Wean Engineering Co., Cleveland, Ohio.

MACHINERY—Bead Wrapping
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Eisler Engineering Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coilers
Boyd & Sons Manufacturing Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Cold Heading
(See Cold Headers)

MACHINERY—Copper Wire Drawing and Rolling
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wickman, A. C., Ltd., Coventry, England.

MACHINERY—Draw Benches
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Royle, John, & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio

MACHINERY—Pointing
Aetna-Standard Engineering Co., Youngstown, Ohio
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd & Sons Manufacturing Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Mach'y Exch. (Used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Spring Making
Lundahl Corp., Hartford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Norsholm Industries, Rochester, Michigan
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Forming
Wickman, A. C., Ltd., Coventry, England

MACHINERY—Strip Steel
Aetna-Standard Engineering Co., Youngstown, Ohio
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N. Y
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

WHERE TO BUY, Continued

MACHINERY—Testing Physical
Lundahl Corporation, Hartford, Conn.
Scott Testers, Inc., Providenec, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I. (used)

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Marshall-Richards Machine Company, Inc., Trenton, N. J.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Federal Manufacturing Co., Wallingford, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply, Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Winding Wire
Federal Manufacturing Co., Wallingford, Conn.
Standard Mill Supply, Pawtucket, R. I.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna-Standard Engineering Co., Youngstown, Ohio
Davis, R. L. Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Standard Machine Co., Mystic, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Youngstown, Ohio
American Insulating Mach'y Co., Phila., Pa.
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Kilmer, M. D. & Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MACHINERY—Wrapping Straight Lengths and Tubing
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Wrapping Wire Coils
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc, Cortland, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.

OVENS—Dehydrogenizing
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Michigan Oven Co., Detroit, Mich.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See Wind-up and Unwind Systems)

PHOSPHATE COATING CHEMICALS
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Bronze Die Casting Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS—
Entwistle, Jas. L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

PRESSES—Hydraulic and Mechanical
Standard Machinery Co., Mystic, Conn.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

REEL AND TENSION STANDS—
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Roll-a-Reel, Cincinnati, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Roll-a-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Plastic
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Proctor Reels, Proctorville, Vt.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Proctor Reels, Proctorville, Vt.

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.

REELS—Pay-off
Norsholm Industries, Rochester, Mich.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Proctor Reels, Proctorville, Vt.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

WHERE TO BUY, Continued

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Prector Reels, Proctorville, Vt.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
(See Ovens—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J
U. S. Steel Export Co., New York, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SALTS—Heat Treating, Descaling, etc.
Holden, A. F., Co., The, Detroit, Mich.
Houghton, E. F. & Co., Philadelphia, Pa.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

SOAPS—Industrial and Wire Drawing
(See Compounds—Wire Drawing)

SODIUM—for Descaling
Du Pont de Nemours, E. I. & Co., Electrochemic l Dept., Wilmington, Del.
Holden, A. F., Co., The, Detroit, Mich.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

TANKS—Steel
Chemsteel Construction Co., Pittsburgh, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TIES—WIRE—
(See Wire Ties)

TINNING PROCESS—
Du Pont de Nemours, E. I. & Co., Electrochemical Dept., Wilmington, Del.
Metal & Thermit Corp., New York, N. Y.

TINSEL—Cords, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL—Electric Resistance
(See: Tinsel—Electric Conductor)

TINSEL—Lame, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Wire
(See: Tinsel—Electric Conductor)

TOOLS—Spring Forming
Lundahl Corporation, Hartford, Conn.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, Jas. L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attlebore, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
H. D. Kilmer Co., Cleveland, Ohio.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—for Electric Wire
N. E. Lacquer Co., E. Providence, R. I.
Standard Varnish Works, New York-Linden, N. J.-Chicago

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Malin & Co., Cleveland, Ohio.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Malin & Co., Cleveland, Ohio.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Montgomery Co., The, Windsor Locks, Conn.

WIRE Manufacturers
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specifications for Special Purposes
North American Philips Co., Inc., New York, N. Y.
American Steel & Wire Co., Cleveland-Chicago, New York.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Specialty Wire Co., Inc., Worcester, Mass.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., New York, N.Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N.J

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE AND CORDAGE MACHINERY MANUFACTURERS

WATSON

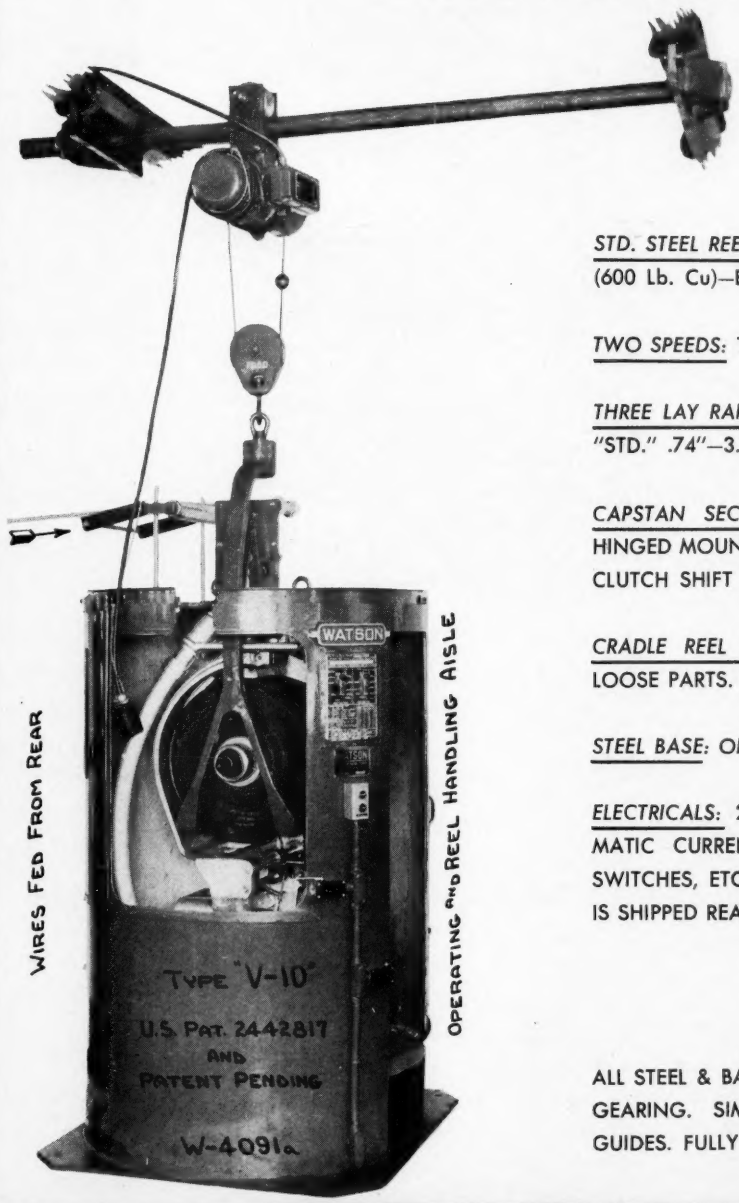
THE NEW "V-10" BUNCHER

U. S. PATENT 2,442,817 AND PATENT PENDING

A HEAVY DUTY—LARGE CAPACITY—HIGH PRODUCTION—MINIMUM SPACE UNIT.

DESIGNED TO MEET THE DEMAND FOR ROW MOUNTED MACHINES CAPABLE OF LONG RUNS OF FINE STRANDS — BUT — ALSO SUITED FOR HEAVY BUNCH STRANDS AND IDEAL FOR GALVANIZED STEEL CLOTHESLINES AND SIMILAR STRANDS.

★ ★ ★



STD. STEEL REELS: 24" x 14" (1000 Lb. Cu) AND 22" x 11" (600 Lb. Cu)—BOTH 5" BORE.

TWO SPEEDS: 1450 & 965 TWISTS PER MINUTE.

THREE LAY RANGES: SPECIFY WHICH. "LOW" .59"—3.01". "STD." .74"—3.76". "HIGH" .89"—4.51".

CAPSTAN SECTION: HEAVY DUTY DOUBLE GROOVED. HINGED MOUNT SIMPLIFIES LAY GEAR CHANGE. EXTERNAL CLUTCH SHIFT SIMPLIFIES HAND OF TWIST CHANGE.

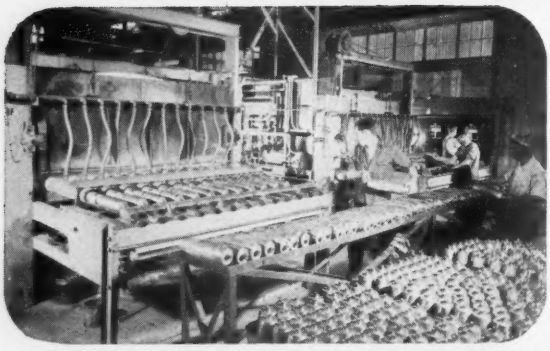
CRADLE REEL MOUNT: OVERHUNG SPINDLE TYPE. NO LOOSE PARTS. SAFETY LOCK.

STEEL BASE: ONLY 52" x 52".

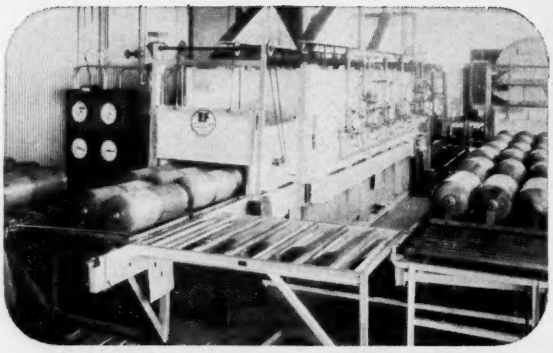
ELECTRICALS: 2-SPEED MOTOR AND CONTROLS, AUTOMATIC CURRENT-OFF BRAKE, ELECTRIC STOPS, SAFETY SWITCHES, ETC. INSTALLED AND WIRED BY US. MACHINE IS SHIPPED READY TO RUN.

★ ★ ★

ALL STEEL & BALL BEARING CONSTRUCTION, OIL HOUSED GEARING. SIMPLEST THREADING TUNGSTEN CARBIDE GUIDES. FULLY GUARDED.



Shell Forgings 75 mm, 90 mm, 105 mm and other sizes are scale-free hardened, uniformly, automatically and continuously, in these and other EF gas fired installations.



Gas Cylinders Compressed gas cylinders or tanks are continuously normalized and annealed—scale-free, inside and out—in this and other EF gas fired furnaces.

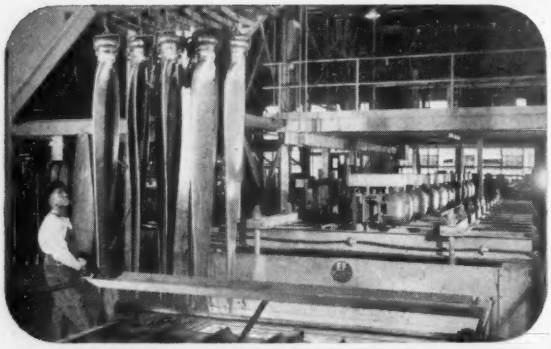
Typical EF Furnace Installations for Defense Production

We have the drawings and have already built these and many other defense production furnaces. Years of experience and complete manufacturing facilities enable us to give dependable service on furnaces for treating jet or propeller type engine parts; tank, automotive or aircraft parts; armor plate; metal powder products, ammunition components and other defense products.

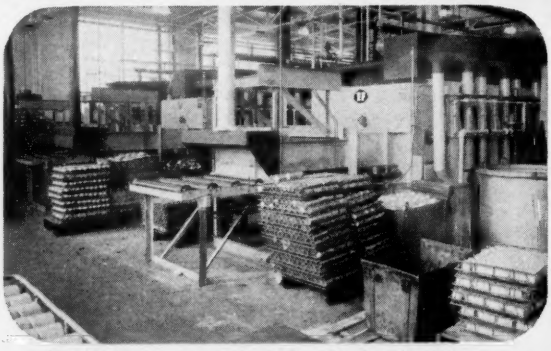
Ask for Bulletin 461-DP

THE ELECTRIC FURNACE CO. • SALEM, OHIO

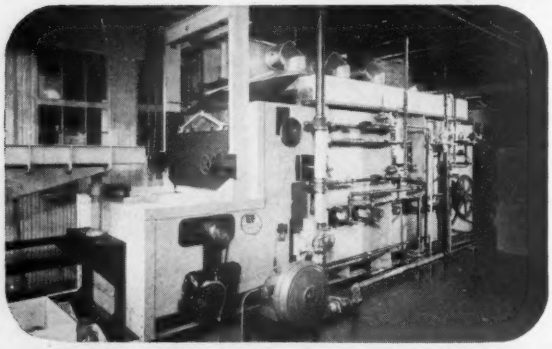
GAS, OIL OR ELECTRIC FURNACES, FOR ANY PRODUCT, PROCESS OR PRODUCTION



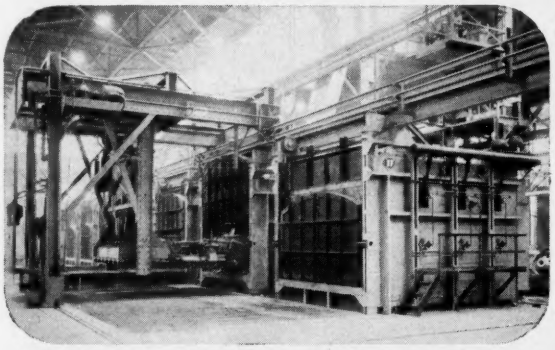
Aircraft Parts Propeller blades are uniformly heated and quenched in this EF continuous furnace. Types available for other propeller and jet type engine and aircraft parts.



Shell Cases A battery of EF gas fired radiant tube continuous special atmosphere, clean annealing and stress relieving furnaces. Other types available for steel or brass.



Cartridge Clips Machine gun cartridge clips, links and other products are scale-free hardened —continuously in EF belt furnaces. Capacities, 175 to 2000 lbs. per hr.



Tank Armor Heavy castings, plate, weldments and other products are heat treated in these EF furnaces. Gantry cranes simplify loading, unloading and quenching.